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L. O. Howard, Theo. N. Gill, E. A. Schwarz,
Wm. H. Ashmead, F. H. Chittenden.

PROCEEDINGS.

113

JANUARY 2, 1896.

President Ashmead in the chair and the following members also present: Messrs. Schwarz, Benton, Heidemann, Marlatt, Pratt, Hubbard, Howard, Gill, Sudworth, Stiles, and Waite.

The election of officers for 1896 resulted as follows: President, C. L. Marlatt; vice-presidents, Theodore Gill and H. G. Hubbard; recording secretary, L. O. Howard; corresponding secretary, Frank Benton; treasurer, E. A. Schwarz; additional members executive committee, W. H. Ashmead, D. W. Coquillett, C. W. Stiles. At the conclusion of the election President-elect Marlatt took the chair and acknowledged in a few remarks the honor done him.

Mr. Schwarz presented the following paper:

SEMI-TROPICAL TEXAS.

By E. A. SCHWARZ.

In the year 1879 I had an opportunity of becoming acquainted with the insect fauna of the vicinity of Columbus, Texas, on the lower Colorado River. The fauna at this point, both of the densely wooded river valley as well as of the adjoining more elevated prairies, is but little modified from the austroriparian fauna of Louisiana. West of the Guadalupe River a change in the character of flora and fauna gradually takes place, owing to the greatly diminished amount of rainfall. This is southwestern Texas, or more properly the low-lands of western Texas, and south of the Nueces River the characteristic features of this region attain their highest development. With the insect fauna of this region I became tolerably well acquainted the past year, during the investigation of the Mexican cotton-boll weevil (*Anthonomus grandis*), carried on by the U. S. Department of Agriculture. It differs essentially from that of Columbus, Tex., but also, though in a lesser degree, from the fauna of the higher plateaus of Texas north and northwest of San Antonio. Still, southwestern Texas belongs, at least as far as the insects are concerned, to the lower Sonoran fauna, of which it forms a marked

subdivision,* but with marked affinities to the austroriparian region.

The valley of the Rio Grande nowhere forms a natural dividing line, and the flora and fauna of southwestern Texas extend into the State of Tamaulipas—how far south, I am unable to state. The explorers of the Mexican fauna have entirely neglected this region, and only a few representatives thereof are recorded in the Biologia Centrali-Americana.

That a number of genera and species of animals belonging to the neotropical region extend northward along the tierra caliente of eastern Mexico and cross the Rio Grande into Texas has long since been recognized, but since nothing definite regarding the exact extent of the region where this tropical fauna is to be found north of the Rio Grande seems to be known, at least so far as the insects are concerned, I venture to place on record a few observations made by myself during a very short visit to the lower Rio Grande in June, 1895.

Collections made at Laredo, San Diego, Corpus Christi, and in the lower Nueces river valley prove that, with few exceptions, no tropical forms occur in that section, and the trip on the stage from Alice to Brownsville shows that the character of the country does not change southward until the black alluvial soil of the delta of the Rio Grande is reached. Here, within the bends of the river, as well as along the various backwaters and old river arms (resacas) which dissect the delta, isolated areas or strips of larger or smaller extent are covered with a dense forest having thick undergrowth of varied shrubbery and a rich vegetation of lower plants, the like of which is not seen at any other place in southwestern Texas. These forest jungles (in Florida they would be called hammocks) are the home of the semi-tropical insect fauna of Texas, which, so far as known to me, has, previous to the year 1895, never been investigated by any entomologist, since even many of the most abundant species are either entirely new or not yet recorded from the United States. If, confining myself to Coleoptera found by Prof. Townsend or myself near Brownsville, I mention the genera Agra, Dasydactylus, Physorhinus, Achryson, Gnaphalodes, Amphionycha, Megascelis, Plectrotreta, Brachycoryne, Listronychus, Polypria (quite a number of others are not yet determined, or undescribed), no one can deny the existence of a semi-tropical insect fauna along the north bank of the lower Rio Grande. The number of species composing this fauna is very large; in Coleoptera alone I estimate that, after proper ex-

* Prof. E. D. Cope, in his paper "On the Zoological position of Texas" (Bull. 17, U. S. Nat. Museum, 1880), calls this region the "Texas district of the austroriparian fauna."

ploration, between 300 and 400 species will be added to our lists.

As stated above, these semi-tropical thickets occur in isolated patches in the lowest parts of the delta; wherever the ground is a little more elevated, the usual mesquite and spiny chaparral, liberally interspersed with Opuntias, make their appearance, and with them the general fauna of southwestern Texas.

To any one coming from the north into this region it becomes at once evident that the Arroyo Colorado, which is the northernmost of the old arms of the Rio Grande, forms the northern boundary of the semi-tropical flora and fauna, while, from information received from Prof. Townsend,* they extend up the river to the head of the same arroyo, or, at most, to the town of Edinburgh (Hidalgo). Toward the coast, the peculiar Yucca-covered ridges form a characteristic feature of the country, and, no doubt, harbor semi-tropical insects. Finally, the maritime fauna of the delta is semi-tropical and probably extends north of the mouth of the Arroyo Colorado as far as Corpus Christi Bay. In what way the semi-tropical fauna is continued southward through the State of Tamaulipas I am unable to state.

The area thus circumscribed within the political boundaries of the United States is extremely small, in fact much smaller than that occupied by the semi-tropical region of Florida or Baja California. Like the Floridian region, the Texan semi-tropical flora and fauna are doomed to almost complete extinction by the progress of agriculture, and already at the time of my visit flourishing sugar-cane fields and corn-fields covered the major part of the area once occupied by the semi-tropical forest.

The paper was briefly discussed by Messrs. Gill, Ashmead, Waite, and Howard. Dr. Gill said that Mr. Schwarz's observations on the extremely limited character of this fauna in Texas agreed with his own deductions from a study of fishes. Fresh-water fishes, he said, were extremely well adapted for faunal distribution studies, on account of their necessary restrictions. We have, in the vicinity of Brownsville, our only representatives of certain characteristically tropical families of fishes, namely, Astyanax and Heros. Mr. Ashmead spoke particularly of the Sonoran fauna of southern Texas, and said that, from his examina-

* See also Dr. V. Havard's paper on the flora of western and southern Texas (Proc. U. S. Nat. Mus., VIII, 1885, p. 449-533).

tions of Hymenoptera, he had satisfied himself of the identity of the fauna of the San Diego region with that of portions of New Mexico, Arizona, and south California. He mentioned certain characteristic forms, particularly Haltichella and Orasema. Mr. Schwarz remarked that the bulk of the insects in the delta of the Rio Grande belonged to the southwestern Texas fauna. The more tropical species in Texas, just as in Florida, occur in island-like spots. In his paper on the semi-tropical fauna of Florida, he had predicted the probable extinction of this fauna by cultivation. At Lake Worth, according to recent collections made there by Mrs. Slosson and Dr. Hamilton, this had already been brought about. The Texas region is much smaller, and the semi-tropical fauna is sure to disappear from our political boundaries, he thinks, as soon as the railroad reaches Brownsville.

Mr. Schwarz also spoke of the fact that the palmetto (*Sabal mexicana*) is characteristic of the semi-tropical in Texas, but not so in Florida, since in the latter state *Sabal palmetto* extends far up the coast to South Carolina. *A propos* to this statement, Mr. Howard remarked that the palmetto occurs wild at the mouth of the Mississippi River, and that the finest specimens of the plant he had seen were growing out of doors in gardens in New Orleans, where they had not been hurt by the severe frost of last winter, which destroyed orange trees in New Orleans. He asked whether the palmetto does not occur along the shores of the Gulf from Florida to New Orleans. Mr. Ashmead said that, in his opinion, it does. Mr. Howard gave a brief account of some of his experiences in south Texas north of Brownsville. Mr. Schwarz mentioned the peculiar fact that in Florida the true insect fauna of the palmetto by no means reaches the northern limits of the distribution of the plant. In the same way in Texas the characteristic fauna of the mesquite ceases at a point far south of the northern range of the plant.

—Mr. Ashmead presented the following paper:

ON THE GENERA OF THE EUPELMINÆ.

By William H. Ashmead.

The *Eupelminæ* were first separated from Westwood's family *Encyrtidæ* as a distinct family under the name *Eupelmoidæ*

by Dr. Arnold Förster, in his Hymenopterológische Studien, in 1856, page 18, the type of the family being the genus *Eupelmus* Dalman, erected in 1820.

In this work Förster gives a table of the genera known to him, and tabulates seven genera—viz., *Halidea*, *Polymoria*, *Ratzeburgia*, *Calosoter*, *Eupelmus*, and *Charitopus*, of which five were new, the genus *Ratzeburgia* being a new name for *Eusandalum* Ratzeburg, preoccupied. *Halidea* is identical with *Metapelma* Westwood, which was unknown to Förster, although characterized as early as 1835.

Förster also overlooked the genera *Urocryptus* Westwood, founded in 1840, *Phlebopenes* Perty, 1834, and *Prionopelma* Westwood, 1835. The latter I consider identical with *Phlebopenes*.

A new genus, *Charilophus*, was erected by Haliday in 1862, from Algiers, while the following year Motschulsky founded his genera *Anastatus* and *Cacotropia* from Ceylon. Walsh's genus *Antigaster* was erected in 1869. It was suppressed by Howard in 1869, who considered it synonymous with *Eupelmus*. It is, however, a valid genus, but must give way to *Anastatus* Motschulsky, the older name.

Balcha was described by Walker in 1864, *Myrmecopsis* Walker, from Australia, in 1866, while in 1874 Förster described *Charitolophus*, a genus with branched antennæ, from Europe, and Westwood *Oodera* from the Malay Archipelago.

In 1883, Peter Cameron erected the genus *Solindenia*, from the Sandwich Islands, and in 1884, in Biologia Centrali-Americana, he describes three new genera—*Brasema*, *Lutnes*, and *Aseirba*. The last, however, has been shown recently by Dr. Howard to be identical with the genus *Cerchysius* Westwood, in the Encyrtinæ.

Finally, a remarkable genus, with branched antennæ in the males, was founded by Howard in 1890, under the name of *Tanaostigma*, who placed it with the *Encyrtinæ*, but which evidently belongs to this group on account of the distinct mesonotal furrows. It is one of the links that bind these two subfamilies together, and, as has already been suggested by Dr. Howard, will form a distinct tribe, with my *Tanaostigmodes*, a closely allied genus described below.

The above-mentioned genera are, so far as I know, all the described genera known up to the present time.

In studying recently some South American, West Indian, and Tropical *Eupelminæ* it became necessary for me to go over the literature on the subject very carefully, and the result is the discovery of several new genera, and as no complete table of the genera of this group has ever been published (the table in Mr.

Cresson's synopsis* giving only a few of the known genera) it appeared to me that the early publication of a complete generic table of this difficult group would be appreciated by the student and add considerably to our knowledge of the structure and distribution of these chalcidids.

With this aim in view, I have therefore prepared the following table, which includes all the described genera except *Balcha* Walk., which is too insufficiently described to be incorporated:

Table of Genera.

Females.

Posterior tibiæ and first tarsal joint not compressed or not broad (rarely with tibiæ slightly compressed).. 2
Posterior tibiæ and first tarsal joint compressed and broad.
Eyes hairy; axillæ meeting at base of scutellum; antennæ 13-jointed...(1) Metapelma Westw.
2 Anterior femora normal.. 3
Anterior femora much swollen.
Winged; anterior femora armed with minute spines beneath; ovipositor very long...............................(2) Oodera Westw.
Wingless; anterior femora unarmed; ovipositor subexserted; head large quadrate; eyes rounded, bare; temples broad.
(3) Ooderella n. g.
3 First tarsal joint of middle legs with strong spines beneath............ 4
First tarsal joint of middle legs without strong spines beneath.
Scutum of mesonotum not impressed; axillæ triangular, meeting at base..(4) Charitopus Först.
4. Frons rarely deeply excavated, although often with deep antennal furrows, the front ocellus never placed in the furrow..................... 6
Frons deeply excavated, the front ocellus always placed in the furrow.
Middle tibiæ not very long 5
Middle tibiæ very long.
Antennæ inserted near the border of the mouth.
(5) Stenocera Walk.
Antennæ inserted far above the mouth border; postmarginal vein greatly lengthened ......(6) Polymoria Först.
5. Axillæ not united at base, their inner suture strongly curved; postmarginal vein very short, scarcely developed, or rarely longer than the stigmal vein..(7) Ratzeburgia Först.
6. Eyes bare 7
Eyes hairy or pubescent.
Scutellum with a broad base against the mesonotum, the axillæ therefore widely separated.
Hind tibiæ with 2 spurs.

Antennæ inserted below the middle of the face, the stigmal vein very long, curved ....(8) Calosoter Walk.
Antennæ inserted above the middle of the face, the stigmal vein very short.....................(9) Chirolophus Hal.
Hind tibiæ with 1 spur (teste Cameron).
(10) Solindenia Cam.
Scutellum with a narrow base against the mesonotum, the axillæ approximate or united at base.
Second abdominal segment short, not incised at apical margin.
Stigmal vein not short; abdomen oval, narrower than the thorax, with the ovipositor subexserted.
(11) Brasema Cam.
Second, third and fourth abdominal segments usually incised at apical margins, the second segment the longest.
Eyes not or scarcely convergent above, the vertex not narrow; frons with a deep Λ-shaped antennal furrow; antennæ 13-jointed, ringed with white, inserted close to the mouth ....(12) Idoleupelmus n. g.
Eyes slightly convergent above, but the vertex not very narrow; frons deeply grooved; antennæ 13-jointed, not ringed with white, clavate, obliquely truncate at apex from beneath, inserted on the middle of the face; abdomen longer than head and thorax united, dorsal segments 1–3 incised at apical margin.
(13) Macreupelmus n. g.
Eyes very large, strongly convergent above, the vertex narrow, the hind ocelli very approximate, the front ocellus placed far anteriorly.
Abdomen spatulate; occiput with a bunch of stiff black bristles behind the ocelli.
(14) Tineobius n. g.
Abdomen long, oblong-oval; occiput normal.
(15) Ischnopsis n. g.
Second abdominal segment as long as all the others united, deeply incised at apical margin...............(16) Lutnes Cam.
Second, third, fourth and fifth dorsal abdominal segments incised or emarginate at apical margins.
Scape long, more or less compressed; post marginal vein very long, the stigmal vein not short, curved.
(17) Cerambycobius n. g.
7. Winged................ 8
Apterous or subapterous.
Metathoracic angles spined; antennæ inserted close to the mouth; face with transverse furrows ....(18) Myrmecopsis Walk.
Metathoracic angles normal; antennæ a little below the middle of

the face, but never close to the mouth; face without transverse furrows.

Segments 2-6 not incised at apical margins.
(19) Urocryptus Westw.

Segments 2-6 incised or at least more or less emarginated at apical margins..............................(20) Eupelmus Dalm.

8. Mesothorax convex, the scapulæ very short, the parapsidal furrows delicate but distinct and strongly convergent and meeting or almost meeting posteriorly in front of the scutellum, conforming to the axillar sutures 11

Mesothorax depressed or concave medially, the scapulæ not short, the parapsidal furrows never strongly convergent posteriorly.

Abdomen clavate or spatulate, broadened behind, narrowed towards base, not as long as the thorax, and depressed or flat above, dorsal flap not incised or the incision not very deep... 10

Abdomen long, conic-ovate, oblong or conically acuminate, as long as or much longer than the head and thorax united, the dorsal flap always deeply incised at apex.

Ovipositor always much longer than the entire body......... 9

Ovipositor shorter than the body, usually shorter than the abdomen.

Antennæ inserted a little *below* the middle of the face, on an imaginary line drawn from base of the eyes, or a little below it..........................(20) Eupelmus Dalm.

Antennæ inserted *above* the middle of the face.

Axillæ widely separated; wings not short, the marginal vein long, the stigmal very short, the postmarginal long; antennæ 13-jointed.
(21) Charitolophus Först.

Axillæ approximate; wings short; antennæ 9-jointed..............................(22) Cacotropia Motsc.

9. Scape compressed, extending far beyond the ocelli.

Basal dorsal flap and dorsal segments 2-4 incised at apex.
(23) Plebopenes Perty (= Prionopelma Westw.)

10. Postmarginal vein two or more times longer than the stigmal vein, rarely only as long.

Head viewed from in front about twice as wide as long, the antennal furrows very deep; eyes round, strongly convergent above; postmarginal vein not longer than the stigmal.
(24) Lecaniobius n. g.

Head viewed from in front at least as long as wide, rarely a little wider than long; antennal furrows not very deep and very short; eyes oblong or ovate.

Malar furrow distinct; no carina from the lower part of each eye to base of each antenna; antennæ inserted on or some-

what below an imaginary line drawn from base of eyes, rarely slightly above this line.

(25) Anastatus Motsch. (= Antigaster Walsh.)

Malar furrow indistinct or subobsolete; a distinct carina extends from lower part of each eye to base of each antenna; antennæ inserted just above the clypeus.

(26) Arachnophaga n. g.

11. Scape broadly dilated below.

Flagellum flattened, the joints of funicle subpedunculated and very much wider than long; postmarginal vein shorter than the stigmal, the latter long, nearly perpendicular with the anterior margin of the wing; abdomen not longer than the thorax, the ovipositor slightly exserted..(27) Tanaostigma How.

Flagellum subclavate, the joints of funicle a little longer than thick, cylindric; postmarginal vein not longer than the stigmal, the latter not short, but oblique; abdomen as long as or a little longer than the head and thorax united, the ovipositor subexserted....... ....(28) Tanaostigmodes n. g.

Males.

Posterior tibiæ and first tarsal joint simple, not much compressed or very broad....... 2

Posterior tibiæ and first tarsal joint compressed, broad.

Eyes hairy; flagellum subclavate, obliquely truncate at tip.

(1) Metapelma Westw.

2. Anterior femora normal........................ 3

Anterior femora much swollen.

Anterior femora armed with minute spines beneath.

(2) Oodera Westw.

Anterior femora not armed with minute spines beneath.

(3) Ooderella Ashm.

3. Antennæ simple, never branched.................................... 4

Antennæ ramose or branched.

Flagellum with four long branches.

Mesonotum depressed, parapsidal furrows vaguely impressed or normal.

Eyes bare.................. ....(9) Chirolophus Hal.

Eyes hairy.. ....(21) Charitolophus Först.

Mesonotum convex, the parapsidal furrows delicate but distinct, running off towards the sides and strongly convergent and meeting or nearly meeting at base of scutellum.

(27) Tanaostigma How.

4. Antennæ inserted just above the clypeus or below an imaginary line drawn from the base of eyes.................. 7

Antennæ inserted on the middle of the face or above or on an imaginary line drawn from the base of eyes.

Mesonotal furrows complete 6

Mesonotal furrows incomplete, vaguely impressed or indicated only anteriorly and converging and ending near the middle of the scutum.

Axillæ united at base or not well separated...................... 5

Axillæ well separated.

Stigmal and postmarginal veins short, the latter shorter than the former and always much abbreviated; hind sutures of axillæ curved; scape not compressed. (7) Ratzeburgia Förster.

Stigmal and postmarginal veins not short, the latter a little longer than the former; hind sutures of axillæ straight; scape somewhat compressed. (8) Calosoter Walk.

5. Hind tibiæ not compressed.

Pedicel not small, obconical, larger than the first funicular joint; scape subcompressed..........................(20) Eupelmus Dalman.

6. Postmarginal vein twice or nearly twice as long as the stigmal.

Scape short; the flagellum filiform; pedicel minute, much smaller than first funicular joint.

Joints 1 to 7 of funicle always longer than thick; the club joints not very long.....................Cerambycobius Ashm.

Joints of funicle very short, much wider than long, the club joints very long.. ....(25) Anastatus Motsch.

7. Hind tibiæ somewhat compressed.

Pedicel obconical, smaller than the first joint of funicle, all the joints of the funicle except sometimes 6 and 7 longer than thick.

Apical margin of none of the dorsal segments of abdomen incised or emarginate.............. (26) Arachnophaga Ashm.

(3) Ooderella new genus.

(Type *O. smithii.*)

Head quadrate, wider than thorax, the temples broad, the frons impressed, but without antennal furrows, although there is an elevation between the antennæ; eyes large, rounded, convex, bare; ocelli triangularly arranged; maxillary palpi 4-jointed; labial palpi 3-jointed; manibles 3-dentate. Antennæ 13-jointed, long, inserted below the middle of the face; the scape, cylindrical, less than one-third the length of the flagellum, the latter long, subclavate, the pedicel shorter than the first funicle joint.

Thorax similar to *Eupelmus*, only the prothorax is longer, while the scutellum and mesonotum are more depressed and do not meet in an elevation or ridge; wings undeveloped, scale-like; legs as in *Eupelmus*, except the anterior femora are much swollen, shorter and much stouter than the middle and hind femora, similar to the genus *Heydenia*.

Abdomen ovate, convex above and beneath and not longer than the thorax, the apex pointed, with the ovipositor subexserted, the dorsal segments 1–5 with apical margins emarginated or incised medially.

This interesting new genus bears a slight resemblance to the Cleonymine genus *Heydenia* Förster.

(1) **Ooderella smithii** n. sp.

Female.—Length 3.5 mm. Head and abdomen black, the face metallic greenish; scape, prothorax, mesonotum, middle legs and hind legs *within*, except coxæ, ferruginous; anterior legs and hind legs *outwardly*, dark fuscous or fusco-æneous; mesosternum æneous black. Flagellum black, 3½ times the length of the scape, the pedicel obconical, much shorter than the first joint of the funicle. There is a tuft of silvery hairs on the middle of the mesonotum just in front of the scutellum, another on the anterior margin of the mesopleura and also on the hind coxæ.

Hab.—Chapada, Brazil, April. (H. H. Smith Collection.)

(4) Charitopus Förster.

(1) **Charitopus schwarzii** n. sp.

Female.—Length 3.5 mm. Elongate, linear, the ovipositor a little longer than the abdomen. Bronze-green, shagreened; antennæ and ovipositor black; legs, except coxæ, brownish-yellow; middle tarsi, except first joint, tips of hind tibiæ and hind tarsi, except basal half of first joint, fuscous. Wings hyaline, the marginal and postmarginal veins very long, the stigmal vein very minute, subsessile.

Type, No. 3458, U. S. N. M.
Hab.—Biscayne Bay, Florida. (E. A. Schwarz.)
This is the only genuine *Charitopus* yet recognized in our fauna, *Charitopus magnificus* Ashm. really belonging to the Cleonyminæ and representing a new genus which I call *Ptinobius*.

(7) Ratzeburgia Förster.

(1) **Ratzeburgia cyanea** n. sp.

Female.— Length 7 mm.; ovipositor 1.5 mm. Wholly cyaneous with slight greenish metallic reflections on mesonotum, mesopleura, apex of first abdominal segment, base of second, and middle of two or three of the following segments; tegulæ, knees and tarsi, light brownish.

Type, No. 3459, U. S. N. M.
Hab.—Arizona.

(2) **Ratzeburgia coquillettii** n. sp.

Female.—Length 4.5 to 5 mm. Head and thorax black; abdomen above bronzed green; legs, except coxæ and hind femora, brownish-yellow, hind

femora fuscous or blackish; wings hyaline with tips and a band across wing just beneath marginal vein, fuscous.

Type, No. 3460, U. S. N. M.

Hab.—Santa Cruz Mts. and Los Angeles, Cal. This species is dedicated to my friend, the distinguished Dipterist D. W. Coquillett, who reared a single specimen at Los Angeles, Cal., from a Cerambycid larva, *Oeme gracilis* Lec.

(3) **Ratzeburgia hubbardii** n. sp.

Female.—Length 4 to 5 mm. Head and thorax metallic brown-black, the face duller and sometimes blue-black, the abdomen very long, acuminate, bronzed green, the whole body sparsely clothed with a sparse whitish pubescence; legs æneous black or fusco-æneous, the extreme tips of anterior tibiæ, their tarsi, middle legs except coxæ and tips of hind tibiæ and their tarsi brownish-yellow. Wings clear hyaline.

Type, No. 3461, U. S. N. M.

Hab.—Crescent City, Fla.; District of Columbia.

Described from many specimens and dedicated to my friend Henry G. Hubbard, who bred it in numbers from the larva of a Coleopteron, *Leptostylus biustus* Lec., boring in orange trees.

(4) **Ratzeburgia hyalinipennis** sp. n.

Female.—Length 5 mm. Closely allied to *R. hubbardii* but the head is bronzed green, the abdomen not so acuminate at tip, the pubescence being more distinctly confined to the abdomen and exceedingly fine or microscopic, while the legs are nearly wholly ferruginous with sometimes only the coxæ and anterior femora æneous, although in one specimen all the tibiæ have a more or less distinct fuscous streak on their outer face. Wings clear, hyaline.

Type, No. 3462, U. S. N. M.

Hab.—Santa Cruz Mts., Cal. (Albert Kœbele.)

(8) Calosoter Walker.

(1) **Calosoter longiventris** sp. n.

Female.—Length 6.5 mm. Dull bronzed green; scape æneous, the flagellum black; legs, except coxæ, fuscous; sutures of trochanters, knees, tips of tibiæ and all tarsi brownish-yellow. Wings hyaline, tegulæ and veins brown, the postmarginal vein a little longer than the stigmal. Abdomen very acuminate, compressed, 2½ times as long as the head and thorax united, the terminal segment forming a long slender stylus.

Male.—Length 3 mm. Agrees with the female in color except the legs are æneous, with only the knees, extreme tips of tibiæ and the tarsi ferruginous; and in structure, except the abdomen is depressed, oblong and scarcely longer than the thorax.

Type, No. 3463, U. S. N. M.
Hab.—Santa Cruz Mts. and Argus Mts., Cal. (Albert Kœbele.)

(9) Chirolophus Haliday.

(1) **Chirolophus kœbelei** n. sp.

Male.—Length 3 mm. Bronzed green, the head in front blue-green; legs, except tarsi and extreme tips of tibiæ, black. Antennæ black, inserted *above* the middle of the face, the scape slightly compressed and extending above the ocelli; joints 1–4 of funicle each with a long slender compressed branch. Thorax as in *Calosoter* except the axillæ, although widely separated, are a little closer to each other than in that genus. Wings hyaline, the veins dark brown, the marginal and postmarginal veins long, the stigmal very short as in *Torymus.* Abdomen long, linear, a little longer than the head and thorax united.

Type, No. 3464, U. S. N. M.
Hab.—Australia. (Albert Kœbele collector.)

(12) Idoleupelmus new genus.

(Type *I. annulicornis.*)

Female.—Head transverse, as wide as the thorax, antero-posteriorly rather thin, the temples flat, seen from in front rounded, the frons with a distinct Λ-shaped antennal furrow; eyes oblong oval, pubescent and somewhat convergent above, the vertex not, however, specially narrowed; ocelli triangularly arranged; antennæ 13-jointed, inserted just above the clypeus; scape slender, cylindrical, the flagellum ringed with white. Thorax as in *Eupelmus*; wings marked with brown and white, the postmarginal vein longer than the stigmal; legs as in *Eupelmus.* Abdomen as in *Anastatus* (= Antigaster Walsh), except it terminates in a long ovipositor.

(1) **Idoleupelmus annulicornis** sp. n.

Female.—Length 1.6 mm.; ovipositor 5 mm. Æneous-black; abdomen, except at base which is pale, blue-black; parapsides, scutellum, mesopleura posteriorly, mesosternum and base of abdomen brownish-yellow; legs honey-yellow, the coxæ and hind femora and tibiæ metallic; middle and anterior femora fuscous medially, the anterior tibiæ with a white band near the base. Wings fuscous, with the base and a subapical band white. Eyes hairy, slightly convergent above, the face with a Λ-shaped furrow.

Antennæ black, joints 7 to 9 white; ovipositor yellowish, the extreme tip black.

Hab.—St. Vincent. (H. H. Smith.)
Described from 1 specimen.

(13) Macreupelmus new genus.

(Type *M. brasiliensis.*)

Head transverse, about twice as wide as thick antero-posteriorly, a little wider than the thorax viewed from in front, the frons a little wider than long, with deep antennal furrows; eyes large, oval, pubescent, slightly converging above but the vertex not very narrow; ocelli arranged in an equilateral triangle; maxillary palpi 4-jointed; labial palpi 3-jointed; mandibles bidentate, the inner tooth broad; antennæ 13-jointed, inserted above an imaginary line drawn from base of eyes, the scape slightly curved, clavate; flagellum clavate, the club obliquely and strongly truncate at apex above, pedicel shorter than the first joint of funicle, joints 1-3 of funicle very slightly shortening but also thickening, but much longer than thick, the first being four or more times longer than thick, funicle joints 4-6 wider than long.

Thorax as in *Eupelmus*, except the axillæ are somewhat separate at inner basal angles; wings more or less clouded, the marginal vein very long, as long as the submarginal or a little longer; the stigmal vein oblique, not especially long and ending in a little uncus; postmarginal vein very long; legs as in *Eupelmus*.

Abdomen long, longer than head and thorax united, clavate, depressed, rounded off at apex and ending in a prominent ovipositor, the dorsum flat with the apical margin of segments 1-4 incised or emarginate, the first two being very deeply incised; venter sub-convex.

(1) **Macreupelmus brasiliensis** sp. n

Female.—Length 4.5 to 5 mm. Blue-black, with a slight æneous tinge, and clothed with sparse whitish hairs, hairs on pronotum and anterior femora black. Antennæ, except spot at tip of scape, black, the flagellum much incrassated toward tip and strongly obliquely truncate at apex from above; eyes brown pubescent. Front wings fuscous, paler at base and tips, with an oblique whitish or hyaline streak extending from the marginal vein backwards towards base of the wing. Legs black, the front tarsi ferruginous, middle and hind trochanters and a spot at base of hind tibiæ white. Mesosternum with a white spot in front of middle coxæ. Ovipositor as long as the first two joints of hind tarsi, brownish-yellow.

Hab.—Santarem, Brazil. (H. H. Smith Coll.)

(14) Tineobius, new genus.

(Type *T. citri.*)

Head transverse, a little wider than the thorax, antero-posteriorly very thin, the frons without distinct antennal furrows or these only slightly indicated toward insertion of antennæ; occiput very flat, the temples scarcely visible back of the eyes, with cluster of black hairs back of ocelli; eyes large, long-oval, pubescent and rather strongly convergent above;

ocelli subtriangular arranged, the front ocellus a little farther away from the hind ocelli than are these to each other; maxillary palpi 4-jointed; antennæ 13-jointed, widely separated at base, inserted rather close to the mouth, or below an imaginary line drawn from base of eyes, the scape long, cylindrical, slightly curved; flagellum rather slender, subclavate, the pedicel longer than the first joint of funicle.

Thorax as in *Anastatus*, the scutellum with narrow base against mesonotum but the axillæ do not quite meet at base; wings clouded, the stigmal vein nearly as long as the submarginal, the stigmal vein oblique, subclavate, about half the length of the postmarginal, which is about two-thirds the length of the marginal; legs as in *Eupelmus* except the hind tibiæ are distinctly flattened, but not so broad as in *Metapelma*.

Abdomen clavate, narrowed toward base, depressed and ending in a long ovipositor, as long as, or nearly as long as, the abdomen; dorsal segments 1-3 incised at apical margins medially.

Resembles the genus *Anastatus* but differs in shape of head in having the hind tibiæ flattened, by the pubescent eyes, long ovipositor and by the incisions of dorsal abdominal segments.

(1) **Tineobius citri** n. sp.

Female.—Length 3.5 mm. General color brownish-yellow or light ferruginous; flagellum black; eyes brown-black, pubescent; face below and between antennæ metallic green; pronotum at sides and disk of mesopleura violaceous, clothed with *silvery* pubescence; mesonotum, except the elevation anteriorly which is metallic green, the short metanotum and the abdomen except basal segment above and beneath which is white, æneous black; ovipositor as long as abdomen, black ringed with white before apex. Hind legs fuscous, hind femora paler beneath, the sharp ridge of hind tibiæ and spot at base of first tarsal joint white; middle tibiæ dusky outwardly. Wings, except basal one third and extreme apex which are hyaline, fuscous.

Type, No. 3465, U. S. N. M.

Hab.—Paramatta, New South Wales.

Described from one female bred by A. Koebele from a Tineid larva predaceous upon *Chionaspis citri*.

(1) **Tineobius californicus** n. sp.

Female.—Length 3.5 mm. Stature and general color similar to *T. citri* but the face below antennæ is not metallic, the prothorax is entirely brownish-yellow, the mesonotum has only a slight metallic tinge, the disk of the lobes being fuscous, the mesopleura have a silvery sheen due to a fine silvery pubescence, while joints 1-3 of middle tarsi and joints 2-4 of hind tarsi are white, the basal joint being entirely fuscous without the white spot, the hind tibiæ, however, and the legs otherwise, except the middle tibia is not fuscous outwardly, are as in *T. citri*. The abdomen,

however, is entirely æneous, not white at base, while the ovipositor is entirely light brown.

Type, No. 3466, U. S. N. M.
Hab.—Kern County, California.
Described from one female taken by Mr. A. Kœbele.

(15) Ischnopsis new genus.

(Type *I. ophthalmica.*)

Female.—Head transverse, as wide as the thorax antero-posteriorly, not especially thin, seen from in front rounded, the frons with a distinct Λ-shaped antennal furrow; eyes large, oval, pubescent and strongly convergent above, nearly contiguous, the vertex in consequence very narrow; hind ocelli very approximate, the front ocellus placed far anteriorly; antennæ 13-jointed, inserted below an imaginary line drawn from base of eyes; scape compressed, sharp-edged beneath; the flagellum subclavate, pubescent, the pedicel as long or a little longer than the first joint of funicle, joints 5 and 6 of funicle a little wider than long, the preceding all longer than wide.

Thorax as in *Metapelma;* legs as in *Eupelmus.* Abdomen elongate clavate, ending in a prominent ovipositor, the first dorsal segment the longest and deeply incised at apical margin.

(1) **Ischnopsis ophthalmica** sp. n.

Female.—Length 4 mm.; ovipositor 1 mm. Bluish, with a metallic green tinge, shagreened; antennæ æneous or submetallic, the flagellum subclavate, with a dense black pubescence, the funicle joints long, the first the longest, the two following about three times as long as thick, the 4th half the length of the 3d, those beyond transverse. Eyes abnormally large, pubescent, convergent and almost meeting above, leaving a very narrow vertex. Face with a deep Λ-shaped furrow, the bottom of the furrow deep violet. Mesonotum flat, but not deeply impressed; scutellum and axillæ on the same plane, the former obconic, the latter triangular. Tegulæ and venation pallid; wings fuscous, the base and outer margin broadly to base of stigmal vein and a large spot at the apical middle white or hyaline; the marginal vein is as long as the submarginal, a little thickened at base; stigmal vein curved, clavate; postmarginal vein long. Legs brownish-yellow, with the anterior femora and tibiæ, except the knees, and the middle and posterior femora and a band at apex of hind tibiæ, brown or black. Abdomen clavate, as long as the thorax, convex beneath, flat above, the first dorsal segment the longest, strongly emarginate at the middle; ovipositor half the length of the abdomen, ferruginous.

Hab.—St. Vincent. (H. H. Smith.)
Described from a single specimen.

(17) Cerambycobius new genus.

(Type *Eupelmus cleri* Ashm.)

Head transverse, as wide as widest part of thorax, viewed from in front rounded, not longer than wide; temples narrow; face with a Λ-shaped antennal furrow; clypeus not separated; maxillary palpi 5-jointed; labial palpi 3-jointed; mandibles 3-dentate; eyes large, oblong oval, pubescent; antennæ 13-jointed, inserted below an imaginary line drawn from base of eyes, widely separated at base, the scape long, slightly compressed, the flagellum subclavate, the pedicel longer than the first joint of funicle.

Thorax long as in *Eupelmus;* wings with the marginal vein as long or nearly as long as the submarginal, the stigmal vein not short, oblique, subclavate, about one-third the length of the marginal, slightly curved, the postmarginal very long, nearly as long as the marginal; legs as in *Eupelmus.*

Abdomen long, longer than the head and thorax united, and ending in a prominent ovipositor, depressed above, convex or carinate beneath, the apical margins of the dorsal segments 1–5 incised or emarginate medially.

(24) Lecaniobius new genus.

(Type *cockerellii.*)

Head transverse, wider than the thorax, viewed from in front twice as wide as long, the face being very short; frons with a deep Λ-shaped antennal furrow; eyes rounded, bare; ocelli triangularly arranged; maxillary palpi 4-jointed, the last joint the longest; labial palpi 2-jointed; mandibles indistinctly tridentate; antennæ 13-jointed, inserted a little below the middle of the face, widely separated at base, the flagellum subclavate, obliquely truncate at tip from beneath.

Thorax as in *Anastatus*, the scutellum with some long black bristles; wings with a fuscous discoidal band or cloud. The marginal vein long, the stigmal vein rather short, ending in a small knob, the postmarginal vein not longer than the stigmal, usually a little shorter; legs as in *Eupelmus*, except that the hind tibiæ are somewhat flattened.

Abdomen much shorter than the thorax, as seen from above flat and ovate in outline, although in dried specimens usually appearing spatulate from the retraction of the terminal segments, beneath triangularly carinated, the ovipositor not exserted or at the most subexserted; the apical margins of dorsal segments are all apparently straight, not at all emarginate or excised.

(1) Lecaniobius cockerellii n. sp.

Female.—Length 2 mm. Head light brown, the vertex usually with metallic reflections and sometimes surrounding the ocelli, more or less æneous; scape of antennæ brownish-yellow, the pedicel and flagellum brown-black. Thorax mostly æneous, strongly iridescent; plate in front of tegulæ, upper surface of prothorax and coxal cavities light brown;

scutellum proper, but not axillæ, red with some black bristles in disk. Legs mostly æneous or fusco-æneous; anterior coxæ at base, their trochanters and their femora and tibiæ within, middle coxæ beneath, their trochanters and most of the femora and tibiæ, except outwardly, light brown, their tarsi whitish; hind legs mostly æneous or fuscous, while the outer surface or ridge of the tibiæ white. Wings hyaline, with a large brown cloud across the wing below the marginal and stigmal vein; abdomen æneous, brownish at base beneath, the ovipositor not exserted.

Type, No. 3467, U. S. N. M.

Hab.—Antigua, British West Indies.

Described from 12 female specimens bred by Prof. T. D. A. Cockerell, from *Lecanium fraternum* Ckll.

(25) ARACHNOPHAGA new genus.

(Type *Eupelmus piceus* Riley.)

Female.—General facies of *Anastatus* Motschulsky (= Antigaster Walsh) but the head is larger, wider than the thorax and antero-posteriorly much thinner, the temples very narrow, flattened; the frons is smooth without antennal furrows, the antennæ being inserted just above the clypeus or much below an imaginary line drawn from base of eyes; there is also a strong carina extending from base of each eye to each antennal socket, while the malar furrow is wanting or subobsolete, never distinct as it is in *Anastatus*; maxillary palpi 4-jointed, the last joint as long as the three preceding; labial palpi 3-jointed; mandibles tridentate; antennæ 13-jointed, the scape long, slender, slightly curved; flagellum subclavate. Thorax as in *Eupelmus*; wings with a large discoidal blotch, the venation similar to *Anastatus*; legs as in *Anastatus*, except the hind tibiæ are somewhat flattened.

Abdomen spatulate, shorter than the thorax and with a prominent ovipositor, the first segment the longest and the apical margins of all the dorsal segments except the fifth, which is obtusely triangularly emarginated, are straight, not incised or emarginate.

(28) TANAOSTIGMODES new genus.

(Type T. *howardii.*)

Female.—Head transverse, as wide as the thorax, the vertex subacute, the temples very narrow, flat, the frons foveated just above the antennæ; eyes oval, bare; ocelli in a straight line; clypeus small, indistinctly separated, with a slight median incision anteriorly; mandibles not large, indistinctly tridentate; maxillary palpi 4-jointed, labial palpi 3-jointed; antennæ 13-jointed, inserted below the middle of the face, the scape broadly dilated below, flagellum subclavate, the tip truncate, the joints cylindrical, the funicular joints a little longer than thick.

Thorax subovoid, about two and one-half times as long as wide, con-

vex above; pronotum very short, abruptly rounded off anteriorly; mesonotum convex, not longer than wide and only two-thirds the length of the scutellum, the parapsidal furrows delicate but distinct, strongly convergent and meeting or almost meeting at base of scutellum, but anteriorly they take a strong divergent curve off to one side so that the scapulæ are rather short and considerably wider at base than long, conforming very nearly in size and shape with the axillæ; scutellum very large, a little more than one-half longer than the mesonotum, the axillæ triangular in outline and barely meet at basal angles, their suture *vis a vis* with the parapsidal furrows, scutellum proper fully twice as long as wide at widest part; metathorax very short, the spiracles small, oval; wings ample, the submarginal vein nearly three times as long as the marginal, the costal cell rather broad; stigmal vein a little more than two-thirds the length of the marginal vein, oblique, with a slight curve, ending in a small uncus.

Abdomen sessile, oblong-ovate, not longer than the head and thorax, concave above, convex beneath, the basal segment the longest, about twice as long as any of the following which are subequal; the apical margin of all the segments except the first, which has a slight median incision, are straight, not incised; ovipositor not prominent, at the most subexerted.

This genus is closely allied to *Tanaostigma* Howard, but is readily separated by the great difference in shape of the flagellum and by the venation of front wings. The ♂ is unknown but will probably be a form with branched antennæ, as has been suggested to me by Mr. Howard.

(1) **Tanaostigmodes howardii** n. sp.

Female.—Length 2.5 to 3 mm. General color brownish-yellow, the thorax above and the abdomen finely shagreened; eyes and abdomen above, except at margins, brown-black, venter subfuscous; funicle joints 1–5 light brown, funicle joint 6 and the club white; tegulæ, propleura and tarsi beneath whitish.

Types, No. 3468, U. S. N. M.

Hab.—San Diego, Los Angeles, Cal., and Arizona.

Described from many specimens reared by D. W. Coquillett from a gall on *Prosopis*.

(2) **Tanaostigmodes tychii** n. sp.

Female.—Length 2.5 mm. Black, finely coriaceous; scape, antennæ, tips of coxæ, trochanters, knees, anterior tibiæ and tarsi and hind tarsi, and sheaths of the ovipositor brownish-yellow or light brown. Parapsidal furrows posteriorly meeting a little before the base of scutellum. Abdomen broadly oval, much shorter than thorax; tegulæ large, brownish-

yellow; wings hyaline, veins light brown, the stigmal vein a little shorter than the marginal, ending in a distinct uncus.

Hab.—San Bernardino, Cal.

Type, No. 3469, U. S. N. M.

Described from one female bred by D. W. Coquillett from larva of *Tychius semisquamosus* Lec. living in the seeds of *Lupinus sparsifloris*.

The following paper was then read by the Secretary:

ON THE AFFINITIES OF NEOLARRA.

By Carl F. Baker, Fort Collins, Colo.

In Bulletin I of the Colorado Biological Association, Mr. Ashmead erected the genus *Neolarra* on a unique male hymenopterous insect collected by Mr. Cockerell at West Cliff, Custer Co., Colo., and named the species *pruinosa*. Following the description he says: "This remarkable insect exhibits strong Larrid affinities in shape, general appearance, and in the partially aborted ocelli, and I was inclined at first to place it in the *Larridæ*, but the distinctly produced labrum, only noticed when describing, induced me to place it finally with the *Bembecidæ;* and it will probably form a distinct tribe in this group, although in its wing characters it is entirely different from any Hymenoptera known to me." Later, Mr. Fox borrowed the unique type and in Entomological News, IV, p. 292, published a figure of the wing and a fuller generic description, rightly calling the type a male instead of a female, as described by Mr. Ashmead. Regarding its affinities, Mr. Fox says: "I quite agree with Mr. Ashmead in stating that it will probably form a distinct tribe of the *Bembecidæ* (so-called), and go further and believe it to represent a distinct group intermediate between the so-called *Bembecidæ* and *Larridæ*. As several authors have demonstrated that the *Larridæ* and *Bembecidæ* are not entitled to family distinction, representing nothing but groups of the *Sphecidæ*, the discovery of *Neolarra* tends to make the assertion stronger. While its affinities to the *Bembecidæ* are shown in the strongly protruding labrum and form of the mandibles, yet its relation to the Larrites is evident in the wings, which are not very dissimilar to the genus *Dinetus*."

During the past summer I collected specimens (male and female) of this species at Fort Collins, on the flowers of *Eriogonum microthecum* var. *effusum*. A little later I took a single

specimen of a new species which seemed in many respects very near *Neolarra*, but which differed in having but one submarginal cell and two discoidals. I at once communicated the news of these two captures to Prof. Cockerell. In a reply he advised me to compare *Neolarra* and *Phileremus!* Not having the material or time to make the comparison, I had dropped the subject until Prof. Cockerell sent me specimens of his new *Phileremus verbesinæ*, which was then undescribed. I was surprised to find *verbesinæ* strictly congeneric with *Neolarra pruinosa*, and was greatly astonished to see that both were unmistakably BEES. They have the greatly produced mouth-parts usual to nearly related bees, and the hairs clothing the body are compound and plumose. I immediately wrote Prof. Cockerell again, but before hearing from him, received the copy of Psyche in which he describes *Phileremus verbesinæ*, and the form mentioned above with one submarginal cell and two discoidals—which he had also found at Las Cruces—as a new genus and species, *Phileremulus vigilans*. He also describes an additional species of the same genus as *Phileremulus nana*. In his reply Prof. Cockerell states that he had communicated to Mr. Fox his suspicions regarding the affinities of *Neolarra* and *Phileremus* and had received the assurance that *Neolarra* was not a bee. But, strange to say, *Phileremulus*—which in general appearance is the exact counterpart of *Neolarra*—Mr. Fox admits is a bee, and a new genus, and stranger still, advises that *verbesinæ*, which is straight *Neolarra*, be placed in *Phileremulus* as a section or subgenus.

Considering the history of *Neolarra*, such a result (viz: *Neolarra*—a bee) seemed so entirely improbable, that I concluded there must have been an error in the determination of my specimens. At this juncture, however, Mr. Ashmead most kindly loaned me the type. It is a very poor specimen, the body almost entirely denuded, the wings and legs on one side gone, those on the other side in poor condition, and the mouth-parts wholly retracted. It enabled me, however, to definitely determine my specimens as *Neolarra pruinosa*. It is scarcely to be wondered that Messrs. Fox and Ashmead found *Neolarra* a most difficult form to place among the Fossores.

But *Neolarra* is not *Phileremus*, and the name will have to be retained, though a most unfortunate misnomer. These allied genera may be distinguished as follows:

a. Anterior wings with one submarginal cell and two discoidals; marginal cell scarcely exceeding stigma........................... *Phileremulus*.

aa. Anterior wings with two submarginal cells and three discoidals.

b. Second submarginal cell much higher than broad and receiv-

ing the second recurrent nervure, the first recurrent joining the first transverse cubital nerve or entering the first submarginal cell at the extreme apex; marginal cell scarcely exceeding stigma .... *Neolarra.*

bb. Second submarginal cell much broader than high, and receiving both the recurrent nervures; marginal cell greatly exceeding stigma.. *Phileremus*

In *Phileremulus* the first recurrent nervure plainly enters the submarginal cell before its apex. As the drawing of the wing of *Neolarra* presented by Mr. Fox in his article (l. c.) is incorrect in several respects, I give herewith drawings of the wings of both *Neolarra* and *Phileremulus.* The veins above the second submarginal cell in *Neolarra* are usually not so much thickened as in the specimen from which the drawing was made.

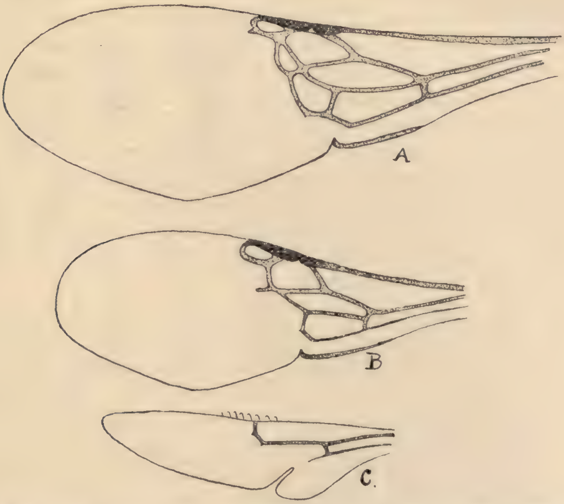

FIG. 1.—A, Forewing of *Neolarra pruinosa;* B, C, Fore and hind wings of *Phileremulus vigilans* (original).

In *Neolarra* the tibial spurs are not 1–1–1 as stated by both Ashmead and Fox, but 1–1–2, the same as in *Phileremulus.* In the type of *N. pruinosa* the remaining posterior leg is so imbedded in glue that a careful examination of the tibial spurs would be impossible. The extruded mouth-parts in *Neolarra* are nearly as long as the head; the labial palpi are 4-jointed, the first joint about as long as the rest combined; the maxillary palpi appear to be 5-jointed, though this may be incorrect. The

small size of the posterior ocelli in *N. pruinosa* is a character of specific value only, as in the very nearly related *N. verbesinæ* they are all large and of equal size. In *Phileremulus* they are also of the same size. Of the clypeus in *Neolarra*, which Mr. Ashmead describes as "not separated," Mr. Fox says "seems to be divided into three lobes, the middle one being by far the largest, most prominent, and extends up between the insertion of the antennæ." It is separated, however, its form being very strongly outlined in undenuded specimens by the manner of growth of the pubescence of the face. By the use of a high-power lens the sutures can be distinguished in the denuded specimen. This sclerite is subtrapezoidal in form, wider than long, the base truncate, and the sides sloping. It falls far short of reaching the antennæ. The median swollen portion of the face between the antennæ, Mr. Fox had mistaken for part of the clypeus.

The female of *Neolarra pruinosa*, which has never been described, differs from the male as follows: Length 4.5 mm. Abdomen brighter rufous, the 2nd, 3rd, and 4th segments not basally darkened. Last dorsal segment not strongly narrowed and produced as in the male; but slightly narrowed to a blunt tip, shallowly concave above, the lateral margins raised, tip on either side with a strong, blunt, erect tooth.

It seems possible from the description that Cresson's *Phileremus fulviventris* may also be a *Neolarra*.

The genera and species discussed above may be listed as follows:

PHILEREMULUS.
 VIGILANS Ckll.
 NANA Ckll.
NEOLARRA.
 PRUINOSA Ash.
 VERBESINÆ Ckll.
 (*Phileremus verbesinæ*).
PHILEREMUS.

Mr. Ashmead discussed this paper and said that Mr. Baker was perfectly correct in his conclusions. He himself in his original description of Neolarra, on account of the poor condition of the type, had mistaken its position. It is not a Bembecid, as he had supposed, but a bee, as claimed by Mr. Baker. Mr. Ashmead exhibited his type, to show by its poor condition that the mistake had not been so serious as might be supposed. He

further said that Haliday had considered the Bembecidæ as rather closely related to the bees, on account of the structure of the mouth-parts. Mr. Ashmead also said that there was a strong affinity between certain wasps, the *Larridæ* and *Nyssonidæ*, and some of the parasitic bees.

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114 FEBRUARY 6, 1896.

President Marlatt in the chair and the following members also present: Messrs. Linell, Gill, Schwarz, Fernow, Patten, Judd, Chittenden, Stiles, Ashmead, Howard, Benton, active members, and Messrs. G. R. Stetson, E. T. Perkins, E. C. Barnard, and Dr. W. J. Karlsioe, visitors.

Mr. Schwarz read the following communication:

SLEEPING TREES OF HYMENOPTERA.

By E. A. SCHWARZ.

Comparatively little attention has been paid by entomologists to the attitudes assumed by insects during the periods of sleep. Crepuscular or nocturnal insects such as Heterocerous Lepidoptera, which sleep during the day-time, can of course be readily observed at that time, and the very characteristic attitudes of many lepidopterous larvæ while asleep or at rest have frequently been described and figured. In diurnal insects, which sleep at night, such observations are not readily made. There is no question, however, that various observations and notes on the subject are recorded, and I distinctly remember having read an account of the sleeping habits of certain bees or wasps, but I am unable to refer to it now.

Thus, at the risk of duplicating an observation already published, I beg to narrate shortly a little experience I had the past year in southwestern Texas, regarding sleeping Hymenoptera. There are three species concerned in this observation, which were kindly determined by Mr. Ashmead. Two of them, *Melissodes pygmæus* Cress. and *Cœlioxys texanus* Cress., belong to the family Apidæ; the third, *Coloptera wrightii* Cress., to the Sphegidæ. All three are extremely abundant in southwestern Texas.

During the extremely dry weather in the spring a peculiar climatic condition prevails in southwestern Texas, day after day, in the early morning hours. From about 5 o'clock until after

8 o'clock, the sky is entirely overcast with heavy, black clouds; the air is extremely sultry and filled with a mist-like fog. To the uninitiated it would appear that a heavy downpour of rain was about to take place, but between 8 and 9 o'clock the gulf breeze springs up, the clouds are dissipated as if by magic, and the brightest sunshine prevails for the rest of the day.

During my stay at San Diego, Duval Co., it was my custom to go into the field every day at half past 7 o'clock, and during these cloudy mornings at the end of April and during the first three weeks of May I had ample opportunity of observing sleeping specimens of the two Apidæ mentioned above. At this hour many butterflies, beetles, flies, etc., were on the wing, but the light was evidently not strong enough, or the atmosphere too heavy and moist, to arouse from their sleep these little bees. Scattered through the chaparral (brush) which surrounds the town of San Diego are numerous dead bushes, most of them being *Celtis pallida*. It is on the thinnest, outermost twigs and more particularly on the stout thorns with which this shrub is liberally provided that single sleeping specimens of these bees are found. Their position is uniform: the twig or thorn is grasped tightly with all of the six legs, and, in addition, the mandibles are widely opened and with their tips firmly inserted into the wood. It requires some force, comparatively speaking, to dislodge the bees from their position.

As stated above, I have seen in print records of a similar attitude of sleeping bees, and I would not have presented this note but for the following additional observation: On the very first day I found that there are certain dead shrubs which serve as sleeping quarters for a multitude of the bees. In the course of time I discovered within a short distance four shrubs (or dwarf trees) upon each of which from 50 to 70 specimens of the sleeping bees could be seen every morning, and several other shrubs which harbored a smaller number of specimens, with plenty of room for more. Here my third species, the Sphegid *Coloptera wrightii*, comes in. It was always on the sleeping trees in company with the bees, but not so numerous as the latter. I never saw it asleep at the hour I made these observations, but the specimens were, like watchmen, slowly walking up and down the twigs, over the bodies of the sleeping bees, carefully and deliberately touching and examining with their antennæ the bees, as if trying to arouse them from their sleep. If I had been on the spot at an earlier hour, or after dark in the evening, I would, no doubt, have ascertained also the sleeping habit of the Coloptera. A well-frequented sleeping tree presents a very striking and exceedingly pretty sight, which I never wearied of observing day after day.

This habit of the Texan Hymenoptera naturally reminds one of the well-known "Butterfly trees" of Monterey, Cala., and Appalachicola, Fla., the sleeping quarters of the Archippus butterfly (*Danais archippus*) during its winter migration into southern localities, but the case of the Texan Hymenoptera acquires a special interest from the fact that three different species, belonging to three different genera, select certain shrubs as common sleeping quarters. There must be something in the nature of these shrubs or their surroundings which attracts the bees. In looking over the ground I observed that the shrubs selected as sleeping quarters are always of small size, about from 4 to 5 feet in height, and always surrounded, and apparently protected, by living shrubbery of much larger size. However, I found a multitude of dead shrubs, of the requisite size and in apparently well-protected situation, upon which I never saw a single sleeping bee.

On May 21 a change in the weather took place; the sky remained clear throughout the night and early morning, and the bees were on the wing long before I made my appearance in the field.

The paper was discussed at length by Messrs. Howard, Ashmead, Benton, Gill, Stiles, and Fernow. Mr. Ashmead expressed great interest in the observations, and said that he had little doubt of their entire novelty. He had noticed wasps in North Carolina in the very early morning but had never seen them asleep. Mr. Benton said that the position of the honey-bee when asleep was well known. The upper ones grasp any projections with their mandibles, while the lower ones grasp, also with their mandibles, and fore feet, the legs of those above. In response to a query, Dr. Gill said that fish, when supposedly asleep, are simply quiescent, with their fins waving at intervals or entirely still. Messrs. Schwarz and Gill further discussed the necessity for sleep in animals and the difficulty of distinguishing between sleep and rest. Dr. Stiles also participated in this discussion. Dr. Gill said that in a generic sense sleep and rest are the same; the former, however, implies dormancy of the faculties, while the latter does not. The difficulty of distinguishing between the two in the lower animals is, in most cases, insurmountable. Dr. Stiles tried to conceive of the sleep of a tapeworm, but found it difficult. Oxyurus, however, he said, undoubtedly has long

periods of rest, and is most active in the evening. Many Protozoa are still for a long time. Dr. Gill said that the Acalephs have also a resting period. Mr. Fernow said that plants also rest or sleep. Their sleep is determined by the cessation of response to stimulus. Mr. Schwarz spoke further of the profundity of the sleep of the Hymenoptera which he had studied in Texas. He took them from the plants with his fingers, and their torpor was so deep that it took them some time to rouse themselves. He said further that the first action of the insect on awakening was to make its toilet, which he described in detail. Dr. Gill introduced the subject of hibernation and æstivation, which he discussed at some little length. Dr. Stiles spoke of necrobiosis, where rest or sleep lasts for eight or ten years. Mr. Marlatt said that the habit which certain Hymenoptera have of hanging by their jaws had been brought to the attention of the Society before. He had noticed them in this position. It would naturally be the one assumed during sleep, since to hang by the legs would necessitate continued action of voluntary muscles, while the jaws remain closed involuntarily. Dr. Gill described the interesting habits of the African Dipnoan Protopterus which, when the streams dry up, goes into the mud and makes a cocoon of slime surrounded by mud and in this condition has been carried to Europe and revived by placing it in water and dissolving the cocoon.

Mr. Howard read a paper on the transformations of *Pulex serraticeps*.*

115 MARCH 5, 1896.

President Marlatt in the chair and the following members also present: Messrs. Schwarz, Benton, Chittenden, Linell, Vaughan, Ashmead, Casey, Heidemann, Howard, Patten, Gill, and Stiles.

Mr. Schwarz announced the approaching completion of the list of Coleoptera of the District of Columbia by Mr. H. Ulke and urged that workers in other orders should now actively take hold of the plan of preparing a complete list of the insects of the District of Columbia. Mr. Ashmead stated that for some years

* Published in Bulletin 4, new series, Division of Entomology, U. S. Department of Agriculture.

he had been recording the Hymenoptera of the District of Columbia and that he hoped with the assistance of Mr. Marlatt in the saw-flies and Mr. Pergande in the ants to soon be in position to give a complete list in this order. He further stated that Mr. Heidemann was nearly prepared to print a list of Heteroptera.

The following preamble and resolution were then introduced and unanimously carried:

WHEREAS, the Entomological Society of Washington has learned with great pleasure of the completion of the manuscript list of the Coleoptera of the District of Columbia, by Henry Ulke,

Resolved, That the Society hereby respectfully recommends to the Smithsonian Institution that this paper be published as soon as convenient as a first paper of a List of the Insect Fauna of the District of Columbia, remaining numbers to be prepared by the members of the Society.

The following new members were elected: Dr. W. J. Karlsioe, New York City (temporary address 821 Seventh St., Washington, D. C.), and Dr. E. G. Love, 80 East 55th Street, New York City.

The President appointed as a Publication Committee for the year 1896, Messrs. Howard, Gill, Schwarz, Ashmead, and Chittenden.

—Under the head of short notes and exhibition of specimens Mr. Ashmead submitted a specimen of a new species of the genus Roctronia of Provancher. This insect when originally described by Provancher was placed by him in the Braconidæ. Later he decided that it was a Proctotrypid near Helorus. Mr. Ashmead recognized the specimen shown in a collection of Braconidæ received from the American Entomological Society. The specimen was a male and was from Southern California. Mr. Ashmead from this specimen decided that Provancher was right in considering the insect a Proctotrypid of the subfamily Helorinæ. He will describe it as *Roctronia californica*.

—Mr. Schwarz submitted two short notes for insertion in the Proceedings; the first one recorded the fact that Cresson in his Hymenoptera Texana mentions the fact that Belfrage states that *Scolia lecontei* rests during the night and chilly weather in clusters closely attached to the stems of grass and plants. The other note recorded the fact that the Empid mentioned on page

146 Volume II of the Proceedings of the Society has been determined by Mr. Coquillett as *Synechus rufus* Klug.

—Mr. Schwarz exhibited specimens of *Pharaxonotha kirschi*, the type of which was found in seeds imported from Mexico to Germany. The same insect Mr. Chittenden found living in Central American exhibits at Chicago. The specimens shown by Mr. Schwarz had been found under leaves at San Antonio, Tex. He does not anticipate that it will become of economic importance as suggested by Mr. Chittenden. Note discussed by Mr. Chittenden.

—Mr. Marlatt, under the title "A Study of the Anatomy of the Hymenoptera," gave a comprehensive view of certain structural features of the Tenthredinidæ,* dwelling at much length upon the homologies of the sclerites of the thorax. This paper was discussed at some length by Messrs. Ashmead, Howard, and more briefly by Messrs. Gill and Casey and Schwarz.

—Mr. Schwarz spoke of a species of Termite which he had found in great numbers throughout southwestern Texas, which burrows deeply under the ground and which is of great economic importance from the fact that during the latter part of summer it destroys the grass and other low-growing vegetation in large patches, rising from the ground and encasing all portions of the plants with a tubular structure composed of grains of the subsoil. Short discussion followed on the subject of the habits of Termites, in which Captain Casey referred to Dudley's interesting observations on the Panama ants, and especially the observations by Beaumont on the repair of the galleries. Mr. Vaughan stated that in his opinion the Termite described by Mr. Schwarz may be found as far north as Austin, since in the vicinity of Austin he has noticed a tubular structure like that described by Mr. Schwarz.

March 18, 1896, Special Meeting.

President Marlatt occupied the chair, with Messrs. Schwarz, Benton, Fernow, Patten, Linell, Gill, Chittenden, Coquillett,

* Published in Bull. 3, Techn. ser., Div. Entom., U. S. Dept. Agric. pp. 10–17.

Ashmead, Sudworth, and Howard (active members), Dr. Fletcher and Dr. Karlsioe (corresponding members), and Messrs. Busck and Keffer (visitors), also present.

—Dr. James Fletcher, of Ottawa, exhibited a small but interesting collection of Diurnal Lepidoptera, made on the high peaks of the Rocky Mountains, at Laggan, close to the summit of the Continental Divide. The specimens shown were mostly taken by Mr. T. E. Bean, a most indefatigable and careful collector. Critical notes were given upon the occurrence and specific value of some of the insects exhibited. *Chionobas beani*, *Erebia disa*, *Argynnis astarte* (rediscovered by Mr. Bean), *A. alberta*, *A. frigga* var. *saga*, *Colias christina*, *Lycæna aquilo*, were spoken of and compared with their nearest allies. He also exhibited a collection of Diurnal Lepidoptera made chiefly by Mr. C. De Blois Green, in the Okanagan Valley of British Columbia. It was pointed out that this district falls within the upper austral life zone, as laid down by Dr. Merriam. Interesting data were given on the dimorphism of *Papilio oregonia* and *P. bairdii*. Mr. W. H. Edwards's experiments in breeding both forms from eggs laid by a single female were spoken of at length. *Colias æmilia*, a very fine species, of which the original types were lost some years ago, but which has been found again by Mr. Green in the Okanagan Valley, was exhibited and compared with *Colias edwardsii*, *C. alexandra*, and *C. christina*. The speaker considered it a grand species and quite distinct from the allied species mentioned. *Lycæna couperi* was shown and the speaker stated that he was unable to find sufficient differences between *L. couperi*, *L. afra*, *L. pembina*, *L. lygdamas* (of Canadian collections), *L. oro* and *L. antiacis* var. *behrii*, to separate them as distinct. Many other rare species of butterflies taken in British Columbia were spoken of and an outbreak of the white pine butterfly (*Neophasia menapia*) was treated of at some length. The larvæ, in the elevated arid plateau which forms the interior of British Columbia, feed entirely on the leaves of the yellow or bull pine (*Pinus ponderosa*), while on Vancouver Island, where this pine does not occur, the larvæ live on the foliage of the Douglas spruce and do much harm. In both places, where the insect was observed in large numbers, the

pupæ were found to be much parasitized by the Ichneumonid *Theronia fulvescens*. The descent of the full-grown larvæ from trees 100 feet high by a silken thread was described. Dr. Fletcher also described a collecting trip in the mountain woods of Vancouver Island, and some of the rarer or more interesting species collected were mentioned. He expressed his very great pleasure at having an opportunity of attending a meeting of the Society, and felt sure that the members who were fortunate enough to live in Washington, undoubtedly the scientific centre of the world as far as natural history was concerned, could not appreciate to the full the difficulties which had to be overcome by students living at a distance from such centres where assistance could be obtained readily at all times.

In discussing Dr. Fletcher's paper, Mr. Marlatt spoke of the great number of Tenthredinidæ in British Columbia. Every general collection of insects made in that region shows very many species of Tenthredininæ and Nematinæ. It happens that these groups are particularly difficult of study, and much rearing must be done to definitely separate the species. Apropos to this remark, Mr. Fletcher referred to the supposed predaceous habit of Allantus and Tenthredo. Mr. Marlatt said that in these forms the mouth-parts are very strong, but are apparently used more for defence than for feeding. The adults are short-lived and do not feed to any extent.

Mr. Howard stated that he had seen in the collection of the Gypsy Moth Commission a specimen of *Cimbex americana* which it was definitely stated had been found flying with the larva of a gypsy moth in its grasp. Mr. Fletcher stated that he had a specimen of Tenthredo with a dipterous insect in its jaws. Mr. Marlatt said that the explanation of such occurrences was probably to the effect that the Cimbex had happened to alight on a spot already occupied by another insect and that the movements of the latter had induced the Cimbex to grasp it, but not for food. These saw-flies are pugnacious.

Mr. Schwarz added some remarks on the present knowledge and distribution of the Coleoptera of British Columbia. The fauna of the islands and the adjacent coast of the mainland is merely a southward continuation of the Alaskan coast fauna. It represents a very marked subdivision of the transition zone, rich

in characteristic genera and species, and may be said to be well known, except that the higher mountain ranges are not yet explored. No Coleoptera from the Cascade range (the coast range of British Columbia) have been recorded, but to judge from a collection made by Mr. H. G. Hubbard and himself at North Bend, in the Frazer River canon, it would appear that this fauna, as a whole, is the same as that of the island region, although in some features it resembles the fauna of the Cascade range of Washington and Oregon. The fauna of the dry plateau of the interior of British Columbia is almost entirely unexplored, but seems to belong to the transition zone connecting the boreal fauna with the eastern section of the sonoran fauna. The upper sonoran fauna possibly enters the southern portion of the province. Of the three ranges of the Rocky Mountain system which are crossed by the Canadian Pacific railroad, the westernmost one—viz., the Gold Range—is, entomologically, entirely unexplored. On the Selkirks and the Rocky Mountains proper, collections have been made which show that the fauna is entirely boreal and almost identical with the boreal fauna of the Lake Superior region.

Mr. Ashmead, referring to the interesting case of dimorphism in the Diurnals, mentioned by Mr. Fletcher, said that in his opinion these phenomena are primarily brought about by the differing character of the different seasons in regard to the rain-fall. In Mississippi, he had noticed, with *Heliothis armiger* that the dark variety came with the rainy season, the light variety being most abundant in dry weather. He had also noticed that with other species the forms inhabiting dryer regions were lighter in color than those inhabiting regions where the rain-fall was abundant. He thinks that perhaps we can explain many cases of dimorphism in this way.

—Under the head of exhibition of specimens and short notes, Mr. Schwarz exhibited a bottle, brought by Mr. Fletcher, which contained two Coleoptera found in red pepper at Victoria, Vancouver Island. One of these was the common *Tribolium ferrugineum*, ordinarily found in such situations, while the other was *Trigonogenius farctus* Lec.*

*Mr. Schwarz's remarks on this insect are printed in Canad. Ent. 28, No. 7, July, 1896, p. 177-178.

—Mr. Schwarz also called attention to a note in the February number of *Psyche* in regard to *Epitrix parvula* as injuring tobacco. The yellow spots in tobacco leaves, which are supposed to add to the value of the leaf in cigar-making, are said to be produced by this insect. The speaker, however, said that this insect eats through the leaf and that these yellow spots are due to fungus.

—Mr. Ashmead exhibited an ant which he thought to be a female of Labidus. The specimen was from the National Museum and labelled Texas. No females of this genus have hitherto been found.

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116 APRIL 11, 1896.

This meeting was held in Baltimore at the invitation of Dr. P. R. Uhler.

In the absence of the President and both Vice-Presidents, Dr. Stiles was made chairman. Aside from Dr. Stiles, Messrs. Uhler, Schwarz, Test, Benton, Mann, Patten, Ashmead, Heidemann, and Howard, with Dr. Henry Skinner of Philadelphia and Messrs. A. Roessler and R. Roessler of Baltimore, were also present.

—Under the head of exhibition of specimens, Mr. Howard showed specimens of a Margarodes from South Africa which had been sent him for determination by the newly appointed Government Entomologist of the Cape Colony, Mr. C. P. Lounsbury. So far as can be determined from these cysts alone, the species appears to be identical with *Margarodes vitium* Giard, hitherto known only from Chile and Argentina. In the Bulletin de la Société Entomologique de France, M. Valery Mayet is said to have announced the rearing of the male in Argentina by M. Marval. From his own observations Valery Mayet concludes that the male appears only once in a number of years. He himself has kept specimens in the encysted state for six years, in healthy condition. He further states that, now that the insect has been found in Argentina, the Cordilleras no longer offer a barrier to its spread, since from the locality given hides, wool, bones, hair, and dried blood are extensively shipped to

Europe. In view of this statement the discovery of the insect in South Africa is very interesting, since from this country the exports to Europe are very great. The insect is much more liable to be carried to other parts of the world in earth around the roots of plants than in any other way. There seems to be strong reason for believing that it injures the roots of the vine.

Mr. Schwarz asked whether the specimens of Margarodes collected by Mr. Swingle in south Florida had been determined. Mr. Howard said that the species seemed, from the encysted form, to be identical with the one found in Jamaica, which, however, was different from the St. Vincent species described by Guilding as *Margarodes formicarum*.

—Mr. Schwarz exhibited two species of Rhynchophorous Coleoptera to illustrate two modes of variation brought about by different disposition and development of the scales. The first species is *Coleocerus marmoratus*. Some specimens are uniformly covered with large white scales, which, in other specimens, are replaced in spots by brown scales, which are usually smaller than the white ones. These brown spots are quite constant in their position but vary greatly in extent. This mode of variation is frequent among the Otiorhynchidæ, e. g., in the genera Epicærus and Sciopithes. The second species exhibited is an undescribed Tychius, extremely abundant on dead twigs of *Prosopis juliflora* in southwestern Texas. Some specimens have the elytra beautifully variegated with spots and lines composed of large white scales, the rest of the elytra being covered with narrower and darker scales. In other specimens the elytra are apparently much less scaly, the scales being grayish-white and more or less hair-like. Between these scales a spongy mass covers the surface of the elytra, and a high magnifying power shows that this mass represents the large white scales in a collapsed or undeveloped condition. Mr. Schwarz explained that in these specimens the development of the scales had apparently been arrested and the surface of the pupa hardened before the air had inflated the scales and before the coloring pigment had entered the same.

—Mr. Schwarz also exhibited three species of Curculionidæ which were bred in great numbers of specimens from the seeds

of *Xanthoxylum pterota* at San Diego, Texas. These are Apion, n. sp., allied to *A. gibbosum* Sharp, from Mexico; *Anthonomus leucostictus* Dietz and Anthonomus n. sp. allied to *A. elegans* Lec. The seeds of the plant were also shown and Mr. Schwarz commented upon their small size when compared with that of the weevils infesting them. The growth of the seeds is apparently not at all interfered with by the working of the larvæ. A fourth Curculionid, *Pachybaris* n. sp., is also peculiar to the same plant, but its mode of life has not been ascertained.

—Mr. Benton spoke of finding two honey-bees impaled on thorns of a locust tree at Charlton Heights, Md. One was stuck through the thorax and the other through the abdomen. He thought they must have been blown against the thorns during a high wind.

—Dr. Skinner read a paper embodying his views on specific values, illustrating his remarks with many examples drawn from the Rhopalocera, and taking for his text the statement that morphological species are tentative and must be tested by study of the life-history.*

Mr. Benton remarked that he had noticed a curious similarity in general color of species of bees to the general color effect of the soil or surroundings in different oriental countries. Dr. Skinner said that if enough material of any species of butterfly could be submitted to him, he could tell pretty accurately from what part of the world the species came.

—Mr. Ashmead read a communication on the genera Stephanus, Megischus and Megalyra and their position in the Hymenoptera. He concluded that the family Stephanidæ does not deserve such rank, and that all three genera should be placed among the Braconidæ, in a subfamily which he called Stephaninæ.

—Mr. Uhler offered some remarks on the "Schlussfeld" or basal fold of the wings of Cicadidæ. He called attention to the cross-veining in the fold of a new and peculiar Melampsalta

* Dr. Skinner's paper is published in Journ. N. Y. Ent. Soc., vol. 4, No. 3, pp. 107–118, under the title "Impressions received from a study of our North American Rhopalocera."

from Japan and noticed the special stiffening of this part by a stout curved vein, similar to that in the genus Cicadetta of Europe. Nothing like this has been recorded of the American species, many of which are equally narrow bodied and have short wings.

—Mr. Benton presented a communication upon the proposed introduction of *Apis dorsata* into the United States, giving an account of previous attempts and particularly of his own journey to Ceylon, in which he described his efforts to secure the bee, and, at some length, the habits of the bee itself and the character of its nests. He desired the opinion of the Society as to the possibility of the successful introduction of this bee into the United States, and on the desirability of such an introduction. In answer to a question by Mr. Mann, Mr. Benton said that the species could not be brought over by the usual method of bringing a queen in a queen cage. Here the only chance is to bring over full colonies. Mr. Ashmead suggested that the intro duction of this large strong bee might have a disastrous effect upon *Apis mellifica*. Mr. Benton, however, said that he had introduced hives of *mellifica* into Ceylon, and that during his stay on the island these colonies did not appear to suffer from association with *Apis dorsata*. Dr. Skinner thought that it possibly might be a good exchange even if *mellifica* should suffer, providing we can domesticate *dorsata*. Mr. Schwarz was of the opinion that *Apis dorsata* would not drive out *A. mellifica*, since the latter is become so strong and so perfectly adapted to domestication. The climate, he thought, would be the most serious difficulty, and he doubted whether there are any portions of the United States where *A. dorsata* would thrive. Frosts, he thought, would be fatal to it, since it has in Ceylon no hibernating period. Mr. Benton, however, said that *Apis dorsata* is reported to occur far north in Hindustan and that *A. mellifica* itself originally came from Palestine and has accommodated itself to the climate of regions far to the north. Dr. Stiles said that, as a general rule, smaller species are more persistent, and doubted whether *dorsata* would successfully compete with *mellifica* for that reason.

117 May 7, 1896.

Vice-President Gill in the chair, and Messrs. Benton, Ashmead, Busck, Fernow, Schwarz, Howard, Stiles, and W. B. King also present.

—Under the head of exhibition of specimens, Mr. Schwarz exhibited once more the wasp impaled upon a thorn, which he had sent from Texas last spring, and which was exhibited by Mr. Howard at the June meeting of the Society. Mr. Schwarz said that there could be no doubt that this insect was impaled by the loggerhead shrike. A majority of the vegetation in that part of Texas is thorny, and these shrikes are very abundant. He found no insects impaled in April, but after May 21 a species of Canthon appeared in myriads and the birds impaled many hundreds of these. Later, a variety of insects were impaled,—grasshoppers and spiders in numbers, and also lizards and horned toads. He never saw the birds eat the creatures thus impaled; they appeared to do it just for fun. Since the introduction of barbed wire fences the birds have become accustomed to impale insects upon the barbs.

Mr. Ashmead said that in Florida in August and later the orange trees are filled with insects, lizards, and toads impaled by the shrikes. Mr. Howard said that the fact that this insect was impaled by the centre of the head suggested that it might have flown violently against the thorn. Mr. Benton referred to the bees mentioned by him at the last meeting and gave many reasons for supposing that they were impaled by being blown against the thorns during a high gale of wind. Mr. Schwarz doubted this, but said that certain large Lamellicorns are often caught on sharp grasses in Florida. Dr. Gill spoke at some length upon the habits of the shrikes and said that insects impaled by force of wind must be very rare. In answer to a question, he said that this habit of the shrikes, owing to the fact that they do not seem to return for food purposes to the insects thus impaled, is evidently a persistence of a former useful habit. Mr. Busck stated that he had seen lizards partially eaten before being pinned.

—Mr. Howard presented some notes on *Scutellista cyanea*, an insect which had probably been imported from the orient into

Italy about the middle of the century and which there is a common parasite of *Ceroplastes rusci*. He announced that with the help of Professor Berlese, of Portici, he expected to be able to introduce this insect into Florida in the hope that it will prey upon species of Ceroplastes which exist there.*

Mr. Ashmead spoke of the tropical appearance of this insect and gave his opinion as to its systematic position. He said that it would be a valuable importation into Florida for the reason that the Ceroplastes scales, while ordinarily affecting plants of little value, were occasionally found upon the orange and ornamental box.

Some discussion followed as to the work of Motschulsky, the author of the genus, and particularly of his descriptions of American insects.

—Mr. Schwarz read the following paper:

TERMITIDÆ OBSERVED IN SOUTHWESTERN TEXAS IN 1895.

By E. A. Schwarz.

1. *Termes flavipes* Kollar.—Common throughout southwestern Texas and very destructive to wood-work in houses. An immense swarm of winged individuals issued from several houses at San Diego on October 25. I was informed that in early spring another flight takes place in buildings infested by termites. What appears to be the same species is also common in sticks and branches lying on the ground in the chaparral, but I failed to get the winged form from such situations.

2. *Termes lucifugus* Rossi.—A large swarm of winged individuals attended by numerous soldiers was observed by me to issue from several holes on a sidewalk in the outskirts of Beeville on November 1. The day was very cold and no flight took place. Upon digging in the ground a few workers were also obtained from the same colony.

I ascertained that the winged form from Texas agreed perfectly with Hagen's description of the European *T. lucifugus*, but would not have dared to publish this determination upon this evidence alone. Mr. D. W. Coquillett, however, informs me that Dr. Hagen gave him this name for the common South Californian Termes, and I also learn that Dr. Hagen determined so a species from Central America for Mr. Dudley.

Should the identity of our species with *T. lucifugus* be estab-

* Rivista dalla Patologia Vegetale, v, No. 1, 1896.

lished beyond a doubt, an interesting question would be presented, viz., is *T. lucifugus* a native of Europe or of America? Of course, it may have been introduced from Europe into North or Central America at an early date, but in looking over the history of the species as detailed by Dr. Hagen in his Monograph the reverse appears to be more probable. The species occurs in all Mediterranean countries of Europe, as well as in Hungary and western France, causing at times considerable damage; but previous to the year 1797 it never attracted any attention; nor is the occurrence of a termite in Europe ever mentioned by the older authors. Dr. Robe–Moreau,* in 1843, raised the question whether *T. lucifugus* could be an importation from America, but left it undecided. Dr. Hagen adds that "at any rate such transportation is not impossible," but in his subsequent writings he never returned to this subject. A study of the inquilines of this species, if there be any, would definitely settle this question. *T. lucifugus*, so far as known to me, has no inquilines in Europe, and if we should succeed in finding among this species in Central or North America peculiar inquilines—*i. e.*, termitophilous insects which do not occur among any other species of termites,—then the home of *T. lucifugus* would be America.

The first notice of the occurrence of this species is in Proc. Boston Soc. Nat. Hist., vol. xix, p. 73, 1877, where Dr. Hagen determines a termite collected by Baron Osten Sacken at Manitou, Colo., as belonging "to a new species, which, singularly enough, comes nearest to the *Termes lucifugus* of Europe." Besides the species found at Los Angeles, Cala., by Mr. Coquillett, I have seen numerous others collected at Manhattan, Kans., by Mr. Marlatt.

Workers and soldiers of *T. flavipes* and *T. lucifugus* appear to be indistinguishable, but the imagos can readily be separated.

3. *Termes tubiformans* Buckley.—This is the grass-destroying and tube-constructing species referred to on p. — of these Proceedings. It is extremely abundant throughout southwestern Texas, occurring, in the spring beneath and within patches of cow dung, and after midsummer in the tubes around grass halms and the stems of other plants. I have never found the true nest, but it is evident that it must be looked for deep in the ground. The species never occurs in logs or other woodwork. Only the workers are known to me; they differ conspicuously from those of *T. flavipes* and *lucifugus* by the dirty, grayish-white color of the head. Buckley describes (Proc. Ent. Soc. Phil., I, p. 213-215) the worker, soldier, and supposed female, but his description contains so many glaring errors that no

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* See Hagen's Monogr. d. Termiten, Linn. Ent., 10, p. 135.

reliance can be placed in any of his statements, and it is more than probable that he confounded several species. It is certainly very strange that at no occasion winged specimens have been found which could be referred to this interesting and economically important species.

4. *Eutermes nigriceps* Haldeman.—I do not hesitate in identifying Haldeman's *Termes nigriceps* (Proc. Ac. Nat. Sc. Phila. 1853, p. 365), described from western Mexico, with a species of Eutermes tolerably abundant throughout southwestern Texas. Buckley's description of *Eutermes cinereus* (Proc. Ent. Soc. I, 1862, p. 212, 213) agrees with my specimens, but his account of the mode of occurrence and habits greatly differs from my observations. Both Haldeman and Buckley describe only the workers and nasuti. Haldeman was informed by his correspondent that "this small species constructs nests, apparently of cow's dung, which are attached to the trunks of trees." Buckley observed his species in San Saba and adjoining counties of Texas. He says:

"It was about sunset on the 22d of October, 1860, when I first saw this species in a field where both worker and nasuti were carrying home seeds of grasses and weeds. They marched in dense columns along pathways leading to a hole near the base of a stump, into which they entered. . . . They dwell in the ground, where they have rooms, seldom more than one to two inches long, connected by tunnels. . . . After rains—which are of rare occurrence in that climate—they make semi-cylindrical tubes, which lie on the surface of the ground to the length of from three to six inches. These arched ways sometimes intersect each other, being connected with chambers below; they rarely work by day above the surface, and never in the bright sunshine. In June, 1861, in Llano County, I saw them carrying home dry segments of post oak leaves of the preceding year's growth."

I found this species throughout spring and fall in smaller or larger colonies, usually within tolerably dry cow's dung, in which it constructs long and winding galleries. Other colonies were seen under fence boards lying on the ground, and one under a large Polyporus lying on the ground. The species is much more active than any other termite known to me, and closely resembles in its movements one of the wingless Psocids. The colonies are composed of workers and nasuti, the former being much more numerous than the latter. In no instance has a single larva or sexed individual ever been seen in such situations. It must be inferred, therefore, that the true nest is deep in the ground.

On May 31 a flight of termites took place on the public square of the town of San Diego during a rain storm. I failed to find the exact spot from which the swarms issued, but the specimens proved

to belong to Eutermes. Since no other species of this genus was ever seen by me in southwestern Texas, I infer that these winged specimens belong to *Eutermes nigriceps*. They agree well with Hagen's description of *Termes* (*Eutermes*) *fumosus* from Vera Cruz, Mexico (Linn. Ent., 14, p. 123), of which Dr. Hagen himself thinks that it may be the winged form of Haldeman's species.

5. *Calotermes marginicollis* Latreille.—A few winged specimens of this common Mexican species were attracted by light in houses at San Diego after the rain on May 21, and some other individuals deprived of wings were found running about during subsequent days.

In addition to these Texan species, Mr. Schwarz exhibited and commented upon the following Termites: 1. Substitute queens of *Termes flavipes* with very short wing-pads found by r. Hubbard at Enterprise, Florida. 2. Workers of *Termopsis angusticollis* Walk., from Lake Tahoe, Cal. 3. An undescribed Termitid genus from Haw Creek, Fla., of which workers, soldiers, and young imagos were found, in June, in a dead palmetto tree. The genus is closely allied to Termopsis, but the antennæ of the imagos are only 16-jointed and the wing venation very fine. The soldiers are remarkable from the form of the head, which is of comparatively small size but vertical anteriorly, the vertical surface being excavated and acutely margined.

This paper was discussed by Messrs. Benton, Ashmead, and Schwarz.

Mr. Benton, referring to the rarity of queens in Termes, and the argument that Mr. Schwarz had advanced that the frequent moving of the colonies would necessitate such rarity, said that the case might be similar to that which holds with the honey-bee and with Melipona and Trigona, where the stimulating food is withheld so as to limit development of eggs previous to swarming, in order to enable the queen to fly. Mr. Schwarz, however, said that it was utterly impossible that the queens of Termites could move. Mr. Ashmead, regarding the introduction of *Termes lucifugus* from Europe to America, or vice versa, mentioned Mr. Schwarz's argument that the presence or absence of inquilines might indicate the country of its origin, but stated that with inquilines it must be somewhat as with parasites, and

that with these we find that the same species of parasite will affect all of the species of the same genus. He further spoke of Caratomus, a supposed Chalcidid parasite of Termes, and of its European and American distribution, and asked as to the European distribution of *Termes flavipes*.

Mr. Schwarz replied that *flavipes* was introduced many years ago into the greenhouse at Schönbrunn, and that it was originally described from specimens taken in this greenhouse. He was not aware, however, whether it had spread from this point in Europe. In North America *T. flavipes* occurs throughout the austral and transition regions and in northern California. As to inquilines, only very small colonies of termites are likely to be transported from one country to another, and as inquilines occur usually only in main nests, it is not likely that they would be transported, therefore the occurrence or non-occurrence of inquilines is likely to be good evidence of the question of the original home of a species.

The following paper was presented for publication in the Proceedings:

A POD-INHABITING LONGICORN FOUND AT THE COLUMBIAN EXPOSITION.

By F. H. Chittenden and M. L. Linell.

Among the Coleoptera collected by Mr. Chittenden at the World's Columbian Exposition, there was one of peculiar interest biologically in being the first longicorn, to our knowledge, breeding in a seed or seed-pod. Two perfect adults and a few fragments were taken from jars containing the pods of one or more species of Enterolobium, a leguminous plant native to Paraguay.

These pods are reniform, about three inches or more long and nearly as wide, from a quarter to three-eighths of an inch thick, and of a woody consistency. A large proportion of the pods showed the exit holes of the beetles, all but a few having escaped before the pods were placed on exhibition, and it is not unlikely that the longicorn began breeding in them while they were still green. Some of the pods which were cut open contained specimens of the beetles which had died in their cells. Most of the pods had been extensively tunnelled, the castings of the borer presenting the same stringy appearance as those of a true wood-boring cerambycid. One of these pods which was preserved intact contains four exit holes distributed at nearly equal

distances upon the concave, and probably under, surface of the pod along its outer margin. The exit holes are oval in shape, about two-thirds as broad as long, and present such a great variation in size that we may expect to find a nearly similar variation in the beetle. The smallest exit hole measures 5mm. in length; the largest is double that size. It should be mentioned in passing that a Bruchus of unknown identity breeds in the seeds of the same plant.

The species agrees in all essential characters with the genus Baryssinus of Bates,* differing from the genus Lepturgus† of the same author in the ciliate antennæ, and with centrobasal carina on the elytra. As the species has very evidently not hitherto been described, the following specific description is appended:

BARYSSINUS LEGUMINICOLA Linell n. sp.

Body broad, ferruginous, densely covered with fine sericeous cinereous pubescence. Antennæ twice as long as body, sparsely ciliate beneath, joints 3 to 11 paler at base, infuscate at apex. Front quadrangular. Thorax with lateral spines slightly behind middle, strong, very acute; sides rounded and convergent in front of the spines, strongly constricted behind them; discs uneven, but without any distinct callosities, maculate with light brown and golden pubescence and two larger dark brown spots anteriorly; a line of coarse black punctures along the basal constriction, along the apical margin, around the tubercles, and a few scattered ones on the disc each side of the median line. Scutellum large, truncate at apex. Elytra broad, sides straightly convergent from the base, rounded at apical fourth, apices truncate with sutural angles rounded, external angles subacute; disc with a broad semicircular depression before middle, maculate with smaller and larger brownish black spots, and some golden spots, mostly collected in a strongly angular, transverse fascia across the middle; centrobasal ridges distinct, crested with black hairs; punctures muricate at base, coarser and denser on the flattened surface behind the crests and humeri and gradually finer and obsolete towards apex. Ventral surface uniform in color. Last dorsal segment slightly produced beyond elytra, emarginate at apex (♀). Legs brown, annulated with pale ferruginous on base of femora, middle of tibiæ and base of metatarsus.

Dimensions.—Length 8.5 mm. Width 3.5 mm.

Habitat.—Paraguay. Described from a single example, probably female, taken at the Columbian Exposition in November, 1893. Type No. 1025 in the U. S. Nat. Museum collection.

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* Ann. & Mag. Nat. Hist., 1864, ser. 3, vol. XIII, p. 43.

† This is the correct spelling l. c. 1863. vol. XII, p. 367.

118

June 4, 1896.

President Marlatt in the chair and Messrs. Benton, Patten, Stiles, Busck, Ashmead, Schwarz, Howard, Gill, Vaughan, Judd, Heidemann, and M. G. Motter and F. S. Chapin also present.

Dr. M. G. Motter was elected an active member of the Society.

—Under the head of exhibition of specimens, Mr. Ashmead showed a specimen of the genus Cardiochiles of Nees, which he had obtained from Schmiedeknecht, and stated that he found it to be identical with Say's genus Toxoneura. It will replace Say's genus and be a type of a subfamily distinct from the Microgasterinæ. He also showed a wasp collected by Mrs. Slosson at Lake Worth, Fla., which is extremely minute and which will form the type of a new genus of Larridæ. He will call the new genus Nitelopterus.

—Mr. Howard exhibited a specimen of an adult and cocoon of *Attacus jorulla* Westwood, and stated that the cocoon had been received from an apothecary in Monterey, Mexico, with the statement that the natives hung them about their necks to prevent the growth of beard.

—Mr. Schwarz exhibited specimens of *Atimia confusa* Say, a Longicorn beetle, previously taken in the Lake Superior region, in the District of Columbia, and in northern Texas, but whose food-habits were not previously recorded. The speaker and Mr. Hubbard had recently ascertained that it attacks Juniper in the District of Columbia.

—Mr. Schwarz also exhibited specimens of *Lachnosterna cribrosa* Lec. from Texas. He spoke at some length on the habits of the species, showing that it feeds on the ground, does not climb, comes out before dark, and is a serious enemy of garden vegetables. There seems to be two parallel series of broods, one issuing later than the other. The species can be checked by ditching, since it is wingless.

—Mr. Marlatt presented a communication entitled "Notes on Texas Insects," relating to some of the common insects of southwestern Texas which came to his notice in the course of a trip in that region in the latter part of April and the first of May. He reports that the collecting was poor, owing to the occurrence

of a severe and protracted drought and was only fair in such of the arroyos as had not been pastured by stock. Among the Lepidoptera referred to were the following: *Oeta aurea* (= *compta*), which in the north breeds very abundantly on Ailanthus, was found in enormous numbers on flowers in the lower Nueces Valley in spite of the fact that the only food-plant known for it does not occur in this region, indicating that it breeds on some local plant. Three butterflies were exhibited which seemed to be, at the season mentioned, the principal representatives of the Rhopalocera, viz: *Synchloe lacinia*, *Eresia ianthe*, both distinctive Texan forms, and *Phyciodes cammellus*, a species which feeds on Aster, and is represented in the national collection now by specimens from Colorado and Utah. This last was the most abundant species, occurring everywhere in numbers. He referred also to the reported very abundant migrations during the week or two before his visit of a white butterfly, which proved from the few scattered individuals still remaining to be *Pieris protodice*. It was suggested that this species had probably bred in excessive numbers on cabbage and as this vegetable was then harvested the migration was a forced one from the failure of the food supply. Among the Hemiptera referred to were the common Cactus Capsid, *Lobos hesperius*, which was very abundant on *Opuntia engelmanni; Lioderma ligata*, which seemed to be a distinctive enemy of the "wild currant" (*Berberis trifoliata*); *Oncerometopus confluens* (?), which was found very abundantly on the pods and terminals of the "coral bean" (*Sophora secundiflora*) north of San Antonio, and the sharp-shooter (*Homalodisca coagulata*), which was collected in enormous numbers, in all stages of development, in arroyos, on various flowering plants, but chiefly on a species of Monarda. In the Hymenoptera, the extreme rarity of bumble-bees was commented on, only a single specimen (*Bombus pennsylvanicus*) being secured. A number of other distinctive Hymenoptera were exhibited, and particular mention was made of *Paniscus geminatus*, the sting of a representative of which was reported by Mr. L. A. Bitterman, of Nuecestown, to have resulted in a very serious tumor. This insect is known commonly in Texas as the "candle fly," and in the instance re-

ferred to was attracted to a lamp, and stung Mr. Bitterman on the neck. Serious inflammation soon resulted, which, in the course of a few days, developed into a swelling. The swelling increased in size until it became a bag six or eight inches long, and the difficulty did not disappear for over six months, at one time seeming to threaten fatal results. Various Coleoptera and Diptera were also exhibited. Among the latter the common characteristic dipterous insect of the season was *Volucella mexicana*. The very injurious cattle pest (*Compsomyia macellaria*) was also collected in numbers by beating. The troublesome mosquito of the season was determined from specimens taken at San Antonio as *Culex pungens*, the bite of which resulted in a very disagreeable inflammation. A few of the more common Coleoptera were exhibited, and particularly *Pasimachus californicus*, which has a local reputation of being one of the most poisonous insects in Texas, and goes by the common name of "Cucurazza."

The paper was discussed by Messrs. Schwarz, Howard, Ashmead, Benton, and Patton.

Mr. Schwarz said that as to butterfly migrations in southwestern Texas he could not speak from personal experience, but he had heard from several persons that this phenomenon is not a rare one, especially in the spring, and that several species of Rhopalocera are concerned in these movements. One of these species is no doubt the Archippus butterfly, which is not to be seen in southwestern Texas during the early summer, but is again extremely numerous during October and November, on its return migration. Regarding the sting inflicted by *Paniscus geminatus*, he expressed some doubt that it should produce serious consequences; he suggested that the sting was inflicted by a Pirates or allied genus of Heteroptera, which are frequently attracted by light. Regarding *Pasimachus californicus*, Mr. Schwarz said that this and the allied *P. duplicatus* are greatly dreaded by the Mexicans throughout southwestern Texas, and the death of numerous persons is attributed to the bite of these beetles. Two other large Carabidæ, a Calosoma and a Dicælus, which occur abundantly in company with the Pasimachus, are not considered as poisonous. In the English-speaking portion of southwestern Texas, along the San Antonio and Aransas

Pass Railroad, this superstition is unknown, but here the unfortunate Pasimachus, popularly known as "shear-bug," has the reputation of being greatly injurious to grape vine and vegetables by cutting the young plants. Mr. Schwarz regretted that on account of his non-acquaintance with the Spanish language he had been unable to gather the numerous superstitions regarding various insects prevailing throughout southwestern Texas, for it was evident that many of these stories must be of very ancient origin. The story of the poisonous quality of Mantis is also of Mexican origin and has found its way as far north as Missouri and Kansas. Mr. Schwarz added that at least two species of Hippelates deserve to be counted among the commonest insects in southwestern Texas. *H. plebejus*, though quite troublesome in some localities, is not such an annoying pest as *H. eulophus* (determined by Mr. Coquillett), which is about in clouds during May and June wherever the soil is sandy. Both Texan species are much less in the habit of getting into the corners of the eyes than the Floridian *H. flavipes*, but they are hardly less troublesome by crawling into the nose, ears, and beneath the clothing.

Mr. Howard referred to Mr. Marlatt's statement that the mosquitoes which bit him at Corpus Christi poisoned him, while those by which he had been bitten in Washington, D. C., did not poison him, and stated that the observation was very extraordinary for the reason that the species collected by Mr. Marlatt (*Culex pungens*) was identical with the commonest of the mosquitoes at Washington, D. C. He jocularly suggested the possibility that the Texas mosquitoes carried contagion, and further suggested that perhaps Mr. Marlatt was not bitten by a mosquito at all, but by some other insect.

Mr. Ashmead referred to the sting of Paniscus and stated that he had several times been stung by Ichneumon flies of the subfamily Ophioninæ. He suggested that it was not remarkable that extraordinary effects were produced in the Texas case, since these insects are attracted to decaying animal and vegetable matter and might have carried bacteria to the patient which caused blood-poisoning.

Mr. Benton referred to the species of Monarda mentioned by Mr. Marlatt and stated that it is a great honey plant.

Mr. Schwarz added some remarks on the insects living on mesquite (*Prosopis juliflora*) and cactus (*Opuntia engelmanni*) in southwestern Texas. The mesquite is abundant throughout the lower Sonoran region, but the insect fauna peculiar to this plant is much richer in species in southwestern Texas than in New Mexico, Arizona, and further west. With *Opuntia engelmanni* the same may be observed, the range of the plant being not identical with that of the insects living upon it. Among the mesquite insects, two species are extremely abundant and of especial economic importance, viz., *Chrysobothris octocola* and *Cyllene crinicornis*, the larvæ of which are greatly destructive to the sapwood of the larger trunks when these are cut down for building purposes or for use as fuel. The engines of the National Mexican railroad use mesquite as fuel, and consequently these two beetles, with their numerous parasites and other insect enemies and inquilines, are constantly carried from Mexico into Texas, and vice versa. Of the Opuntia insects, the most important are the larvæ of Monilema working underground in the roots, the most abundant species being a race of *M. crassum*. Clumps of plants infested by them can at once be recognized from their stunted growth. Above ground the stems are sometimes destroyed by a combined attack of certain Diptera and Coleoptera. An undescribed little Ortalid fly breeds in the stems, apparently without injury to the plant, but after the flies have emerged the small cavities wherein they developed are used by two species of Acalles (*nobilis* and *turbidus*) for oviposition. Their larvæ considerably enlarge the cavities, and after they have finished their transformation the stems are occupied by the larvæ of the Syrphid *Copestylum marginatum*, which convert the interior of the stem into a badly-smelling fluid.

119 OCTOBER 8, 1896.

Vice-President Gill in the chair and Messrs. Schwarz, Hubbard, Ashmead, Mann, Benton, Heidemann, Pratt, Johnson, Motter, Howard, Fernow, Ulke, and C. R. Linfoot also present.

The Chairman announced the death, on August 9th, of Mr. Henry F. Schoenborn, who had been a member of the Society for something more than a year. He said that Mr. Schoenborn had been a resident of Washington for more than 40 years, and that he possessed the largest private collection of Lepidoptera in the city. He paid a tribute to Mr. Schoenborn's excellent qualities as a man, and especially to his generosity as a collector. His knowledge of local forms in the Lepidoptera was probably greater than that of any other Washington entomologist.

—Under the head of "Exhibition of Specimens," Mr. Ashmead showed a female Thynnid, which he had found in the National Museum collection labelled "Alameda County, California," by Koebele. This is the first North American species of this family, with the exception of a male recorded by Patton, also from California. Mr. Ashmead's specimen will form the type of a new genus resembling the South American form Aleurus. He will call it *Glyptometopa americana*.

Mr. Howard suggested that both Mr. Ashmead's specimen and that mentioned by Patton were possibly imported individuals from either Australia or South America, in which suggestion Mr. Schwarz agreed, stating that both specimens were taken shortly after Mr. Koebele's return from successful trips to Australia.

Dr. Gill spoke of the former connection between the Australian, African, and South American continents, and of the hitherto known distribution of the Thynnidæ as dependent upon this former connection. He thought that the fact that the new genus belongs to the South American type is confirmatory of the idea that it is a native form and that we have simply an instance of the northward extension of the range of the family.

—Mr. Heidemann exhibited a drawing of the winged male of *Rheumatobates rileyi*, showing that the description of the

species must now be revised. In his opinion Rheumatobates is more closely allied to Stephania than to Halobates, as suggested by Meinert. The distribution of *R. rileyi* is now Long Island, Ithaca, N. Y., Knoxville, Tenn., Chesapeake & Ohio Canal, above Washington, D. C., and Potomac River, also above Washington, D. C. It is probably a wide-spread species. He referred to the finding of a congeneric species in Grenada and its description by Meinert, and also to the erection of another genus from the same species by Uhler. Mr. Ashmead said that while in the Halobatidæ winged forms are rare, he is inclined to believe that in long warm seasons winged forms may appear in nearly all species.

—Mr. Pratt exhibited specimens of the curious spine-like cases of *Coleophora octagonella* Walsingham, taken from orange by Mr. Hubbard, and exactly resembling the thorns of orange. Mr. Hubbard stated that this case is made of excremental pellets voided by the larva and gave details of its construction. Mr. Ashmead stated that the same species is found upon scrub oak in Florida. When he first saw it he took it for a remarkable gall. Its presence upon oak negatives the idea that the resemblance to a thorn is protective. Mr. Hubbard stated that he had found the cases upon many different trees. He thought that the thorn resemblance was originally protective and that probably the species acquired it on orange or some similar thorny plant, and subsequently extended its food range. Mr. Ashmead referred to the fact that the native food of *Papilio cresphontes* in Florida is the prickly ash, yet larvæ taken from orange will not feed on ash. This indicates that the food-habit change is of long acquirement. Mr. Schwarz had seen the same species upon Xanthoxylum in Texas, but had never seen it upon orange in that locality. Mr. Pratt stated that in the National Museum collection there are four or five cases like those exhibited, but darker in color, and labelled as coming from apple. Mr. Howard suggested that several distinct species might have formed similar larval cases, as is readily noticed with the species making pistol-shaped cases. Dr. Gill stated that the superior numbers of cases upon orange, as pointed out by Mr. Hubbard, could unquestionably be accounted for on the ground of protective resemblance.

—Mr. Hubbard presented a preliminary notice of a new Coccid on birch.*

—Dr. Motter presented a paper entitled "A contribution to the study of some necrophagous Diptera."†

In discussion Mr. Schwarz congratulated the speaker on having taken up such an important subject. So far, Mégnin has been the only student in this direction, and if Dr. Motter's observations do no more than control Mégnin's they will be valuable. He himself had been astonished at the results obtained up to the present time. We know nothing that occurs under the ground. That certain surface insects reach to a depth of 6 feet is in itself interesting. He suggested the importance of carefully distinguishing between the fauna of cadavers and the fauna of coffins. Anticipating the publication of some of Dr. Motter's other results, he stated that the very rare Staphylinid, *Eleusis pallida*, had been found by Dr. Motter in comparative abundance in old graves.

—Mr. Ashmead read a paper entitled "A new genus of Larridæ."‡

126

November 12, 1896.

Vice-President Gill in the chair, and Messrs. Fernow, Schwarz, Pratt, Patten, Johnson, Busck, Ashmead, Benton, Howard, Cook, Waite, Swingle, Heidemann, active members; Messrs. Lugger and Alwood, corresponding members; and Messrs. Sirrine and Linfoot, visitors, also present.

Rolla P. Currie, U. S. National Museum, was elected an active member.

—Mr. Ashmead exhibited a specimen of the European *Proclytis grandis* Foerster, and in comparison with this a specimen of the same species collected by Mrs. Slosson, at Franconia, N. H. Mr. Schwarz said he considered it surprising that more of the Micro-Hymenoptera of Europe have not been found in this country.

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* Withheld for publication in Bulletin 12, new series, Division of Entomology, U. S. Dept. Agric.

† Withheld for publication elsewhere.

‡ Published in Entom. News, Jan. 1897, p. 22.

In the Coleoptera many species of the circumpolar fauna are common to both countries. Mr. Ashmead replied that the reason for this is that the Micro-Hymenoptera have not been carefully studied and compared with the European forms. As a matter of fact, however, he knows 25 species which occur on both continents, and a number of others which are probably identical with European forms. For example, he knows one of Cresson's species of Cryptus to be identical with an European species, and 3 or 4 Pteromalinæ and Encyrtinæ, as well as some of the Aphid parasites.

—Mr. Schwarz exhibited two European Coleoptera recently found for the first time in North America, viz., *Attagenus schaefferi*, from Wyoming, and *Lathridius hirtus*, from Montana. He also exhibited specimens of *Cartodere watsoni*, originally described from Madeira, which now occurs rather commonly about the U. S. Department of Agriculture in Washington, D. C. It was first noticed some years ago in a sack of Lepidoptera from Alaska, which, however, had been stored for some time in San Francisco. Since that time it has been found every year in the buildings of the Department. He also exhibited a photograph of the Natural Bridge, Arizona, the locality in which the very beautiful Coleopteron *Plusiotis gloriosa* has been found in considerable numbers. He suggested that this insect probably feeds upon grape, and asked Mr. Fernow, who spent the summer in Arizona, to describe the region.

Mr. Fernow gave some details as to the geography of the region, which, he said, afforded a wonderful collecting ground. For example, he counted 100 species of trees and shrubs while passing over the bridge. There are, as a matter of fact, grape vines growing on the bridge.

—Mr. Howard exhibited specimens of his *Coccophagus orientalis* originally described from specimens reared from scale-insects in Ceylon, by Mr. E. Ernest Green, and stated, apropos to the use of geographic specific names, that this oriental species, one week after its description was published, was reared by Prof. H. A. Morgan, in Louisiana, from a local scale-insect, *Lecanium hesperidum*, and that there was no evidence of the plants upon which it occurred having been imported.

—Prof. O. F. Cook exhibited specimens of two new American species of Japyx, one from Alabama, and the other from Ventura County, California. He also showed a specimen of Casey's genus Gastrotheus, originally described as a possible coleopterous larva, although subsequently rightly referred to the Thysanura. Mr. Cook finds it a genus of true Thysanura, distinct, however, from recognized families by the presence of two pairs of several-jointed abdominal legs, acting as supports to the abdomen. He thought it necessary, in consequence, to admit at least a new sub-order, which he would call Gastrotheoidea. The same speaker also exhibited two specimens of an African insect closely related to or identical with Dyscritina Westwood. He also showed a specimen of Walker's remarkable genus Hemimerus, collected in Liberia, but not on a rat, the supposed habitat of the Hemimerus. He also showed a specimen collected in Liberia, under rotting wood, which will possibly form a new order of insects of the Orthopterous series. He also showed a specimen of Cryptostema Westwood, an African Arachnid now recognized as the type of a distinct order originally based on a fossil genus and now known by Thorell's name of Meridogastra. Finally he exhibited a small Arachnid collected under stones at Muhlenberg Mission, Liberia. It has an 11-jointed abdomen, distinct by a constriction from the cephalothorax, which has an evident transverse suture. The palpi are not chelate nor modified for prehension as in the Pedipalpi. The genus has been named Artacarus and will probably constitute a family distinct from the Schizonotidæ and also serve as the type of a distinct order of Arachnida, which may be known as Artacarida, although this name should not be supposed to carry an implication of especial affinity with the mites.

—Mr. Johnson presented the following paper:

NOTES ON THE MORELOS ORANGE FRUIT-WORM.

By W. G. Johnson.

The habits of the Morelos orange fruit-worm *Trypeta ludens* Loew were first described by Dr. Riley in August, 1888, in an illustrated article in Insect Life (vol. I, pp. 45–47). He says: "We have for some time been aware of the existence in Mexico

of a worm which damages the fruit of the orange, boring into the pulp and rendering it unfit for eating purposes. It has been described to us by non-naturalists as a large white worm of perhaps an inch in length, of which no sign could be seen from the outside of the fruit. The existence of such a fruit-worm in Mexico has always seemed important to us on account of the danger of importation into the orange-growing regions of the United States, and we have several times instructed our agents who were visiting New Orleans, into the markets of which Mexican oranges are largely imported, to search for infested fruit. Mr. Howard, in 1884, ascertained that the fruit dealers in New Orleans were familiar with the existence of such a worm, but during the time at his disposal he was unable to obtain specimens. In the summer of 1887, however, Mr. Bruner went to Mexico upon leave of absence for a collecting trip, and was urged, incidentally to the other objects of his trip, to look into this matter and to secure specimens, if possible, of the worm in question. He ascertained from conversation with intelligent Mexicans that there were probably three worms which injured the fruit of the orange in that country. The one was a worm which works only in the skin of the fruit in the States of Michoacan and Jalisco, but which, from description, appeared to be a Tortricid. Another worm was described as being short and thick and working inside the fruit in the same States. He was unable to learn of any worm in the fruit in the States bordering the Gulf of Mexico. The third worm was found by Mr. Bruner, and the imago obtained from specimens which he brought home. These proved to be *Trypeta ludens*, according to Loew's excellent description and figure."

According to Mr. Bruner's notes, this worm was found most abundant in oranges raised in the State of Morelos, 100 miles south of the City of Mexico, and fruit from that State was very liable to be infested. He first discovered the worms in an orange he had opened to eat, and a second one containing maggots came to his notice on the train. None of the fruit showed outward signs of occupancy by insect larvæ. Returning to Nebraska early in December, Mr. Bruner placed the infested oranges in a breeding-jar from which he reared the first adult fly February 9. This was the first time the fly had been bred, and has not been bred since, except by the present writer, so far as I am aware.

On the 10th of January, the present year, while residing in Champaign, Illinois, my wife called my attention to an orange, bought from a local dealer, which contained a number of worms. Two days later Prof. T. J. Burrill of the University of Illinois brought me half an orange, also from the local market, in the

same wormy condition. In both instances the fruit was perfect, so far as external appearances were concerned. There were no visible ruptures or punctures in the skin, and the flavor of the fruit, as I afterwards tested, was sweet and luscious. The maggots were about one-third of an inch long, of a dirty whitish color, and worked their way freely through the pulp.

The pieces of orange together with the larvæ were placed in a glass dish in the bottom of which about three inches of clean, loose dirt had been previously placed and dampened. The dish was afterwards covered with a piece of glass. After three or four days the fruit became very mouldy, but the larvæ continued feeding until January 18, when two of them, now about 11 mm. long by 2 mm. wide at the posterior end, went into the ground. They burrowed about in the earth for several days, one of them pupating the 21st and the other the 24th. Two dead larvæ and one full-grown in good condition were removed the 20th and placed in alcohol. The first adult, a male, issued February 28th, or just thirty-eight days after pupation. Four days later—that is, March 3—a second fly, this time a female, emerged after passing thirty-nine days in the pupa stage. These results agree fairly well with those obtained by Mr. Bruner. In his experiments he obtained the imago about forty-one days after the formation of the pupa.

I made careful inquiry about the source of the infested oranges and finally traced them to a large commission house in Chicago. After some correspondence with the proprietors, I found that they had had a large consignment of oranges from the vicinity of the City of Mexico, and that the fruit sold to the dealers in Champaign was from that lot.

From what I have seen of this insect it seems to me that it is extremely probable that it will sooner or later find its way into the orange-growing districts of the United States. The fly is very hardy, and will stand considerable neglect. I kept a male and female for several days in close confinement in a glass-covered dish, and they were seemingly as active as ever when removed. They can withstand a considerable variation in temperature, as shown by Mr. Bruner. On several occasions, during the progress of his experiments, the mercury fell below the freezing point in the room where his breeding-cage stood. With the present facilities for transportation, it would be an easy matter to carry this pest in oranges even from the local markets of Chicago to Florida, Louisiana, or California.

It appears from the original description * of this insect that Loew

* Review of N. A. Trypetina, Mon. Dipt. N. A., Part III, Sm. Inst., 1873, p. 223, Pl. XI, Fig. 19.

described it from a pinned specimen, a male, from Mexico. So far as I can ascertain, no description from living specimens has been made. I therefore give a detailed description of both male and female, drawn from the insects while alive, as follows:

Male and female:—Dorsal aspect of thorax and abdomen, including the ovipositor in the female, approaches raw sienna in color.*

The ventral and lateral aspects of the body, the legs, poisers, head except the eyes, straw-yellow. Frontal bristles black. Basal segments of antennæ same color as lower part of head and thinly covered with short black hairs; last segment of antennæ deep chrome yellow, bristle black, except at base, and about twice as long as segment. Face a little receding, furrows for the reception of the antennæ proportionately rather deep. Opening of the mouth rather widened, border sharp.

Proboscis rather thick, with the suctorial flaps slightly prolonged, and covered with yellowish-brown hairs; palpi prominent and covered with blackish hairs. There are three longitudinal sulphur-yellow stripes, two lateral and one mesal, on the dorsal surface of the thorax; the mesal one extends from the cephalic margin of the thorax to the scutellum, but is not as distinct as its cephalic as at its caudal end where it is widest; the lateral ones are more distinct and extend from the suture caudad to the posterior margin of the thorax; there is also a stripe same color as the preceding each side of the thorax running from the base of the wing along the lateral aspect to the cephalic margin of the thorax. Scutellum is prominent, same color as stripes, has four black bristles arranged around the upper margin of the posterior portion. Short hairs of the thorax yellowish; bristles black. Metanotum with a black stripe on each side. Abdomen of the male with blackish, very short hairs and a row of black bristles around the margin of the last segment; last segment a little longer than the two previous ones taken together. Abdomen of the female marked above by three distinct straw-yellow bands, with the segment at base of ovipositor same color; first segment as long or longer than the two immediately following it; segments below covered with yellowish hairs; the caudal margin of all except the first two bear several blackish bristles. Ovipositor approaches raw sienna in color, darker at tip, covered with short blackish hairs, and measures about 4 mm. in length. Legs straw-yellow, covered with short yellowish hairs, anterior femora with a row of stout blackish bristles on the under side; coxæ with several black bristles; tibiæ of medium pair of legs with a stout black spine (spur) at the anterior end. Wings are 8 mm. long

*According to Ridgeway Nom. of Colors.

by 3 mm. wide; bands brownish-yellow with brown edges, entirely brown near the posterior border and tip; markings agree with those figured by Loew. Total length of the female including the ovipositor, 11 mm. wing expanse, both sexes, about 19 mm.

Mr. Howard said that the present time was unquestionably the most favorable for the establishment of this insect within our boundaries that had existed. One result of the destruction of the orange trees in Florida by last winter's freeze has been to send orange buyers to neighboring tropical countries and that a number of them had gone to Mexico, with the result that last spring and the present winter there has been an enormous shipment of Mexican oranges into the United States. He told of one English buyer who had gone direct to the State of Morelos, and had been shipping oranges by the wholesale into this country. He further mentioned recent newspaper accounts of the finding of what is undoubtedly this same insect in oranges used for table purposes in Cincinnati.

Messrs. Ashmead, Swingle, and Schwarz further discussed the probability of introduction and showed that Mexican oranges are actually in use in great numbers in Florida, especially in the large hotels.

Mr. Schwarz read the following paper:

A NEW CAVE-INHABITING SILPHID.

By E. A. Schwarz.

While the caves of Europe are inhabited by many remarkable genera and species of Silphidæ, the pretty thorough exploration of many North American caves has produced only a single peculiar species of this family, *Adelops hirtus* Tellk. which is quite abundant in most caves of the Green River basin of Kentucky. It bears all characteristics of a true cave insect except that the eyes are feebly developed. Another Silphid, *Choleva alsiosa* Horn, occurs in various caves of Kentucky and Indiana, but it does not differ structurally from its congeners which live above ground in decaying fungi and under vegetable debris. Moreover, it was originally described from the Yukon River of Alaska, where there are no caves. It is interesting, therefore, to record

the occurrence of a third cave-inhabiting Silphid which, although provided with fully developed eyes, shows an approach to the genus Adelops in several structural characters. It was discovered in an hitherto unexplored cave region by Dr. C. Hart Merriam, who kindly referred the specimens to me. The species may be described as follows:

Ptomaphagus cavernicola, n. sp.—Form oblong, convex, finely pubescent, shining, brownish-piceous, head blackish, mouth-parts and basal half of antennæ testaceous, legs brownish-red. Head very finely, not densely punctulate; eyes flattened, finely but distinctly granulate; a deep transverse impression in front of them; antennæ unusually slender and distinctly longer than head and thorax, joints 2 and 3 each nearly three times longer than wide, joints 4, 5 and 6 gradually decreasing in length but joint 6 is still longer than wide, joints of club very little wider than the funicle, joint 7 slightly longer than wide, joint 8 slightly narrower than the adjoining joints and about one-third the length of joint 7, joints 9 and 10 quadrate, terminal joint longer than wide, acuminate.

Thorax at base about one-third wider than long, sides arcuatedly narrowing in front, nearly straight behind, base slightly sinuate each side near the hind angles which are distinctly produced and acutely rectangular; surface transversely strigose and extremely finely punctulate, the strigæ much finer and denser at the sides than in the middle.

Elytra at base as wide as the thorax, very gradually narrowing apically, sides feebly arcuate, sutural angle slightly produced, surface strigose, the strigæ slightly oblique and a little finer and denser than those on the disk of the thorax, sutural stria rather deeply impressed.

Under side densely punctulate and finely pubescent, mesosternal carina just as strong and abruptedly elevated as in Adelops; legs very slender, femora densely punctulate, terminal fimbriæ of tibiæ very minute and of equal length, spurs of hind tibiæ of equal length.

Male: Joints 1 to 3 of front tarsi distinctly but not strongly dilated.

Length, 2.7–3 mm.

Described from four specimens (two of them in rather fragmentary condition) found by Dr. C. Hart Merriam in Marble Cave, Stone Co., in southwestern Missouri. The type, a female (type No. 1424), has been placed in the collection of the U. S. National Museum.

The species is intermediate in characters between Ptomaphagus and Adelops, having the general appearance and the large eyes of the former and the slender antennæ, ante-ocular impression and slender legs of the latter genus. The two genera are structurally so closely allied that there is no room for the establishment of a third intermediate between the two.

Mr. Ashmead, apropos to the generic position, said that in his opinion, instead of enlarging the characters of Ptomaphagus to include this species, he would prefer the erection of a new genus as the simplest course and the least confusing to subsequent workers. Mr. Schwarz differed from the speaker and said that in many cases it was unquestionably necessary to enlarge the scope of a genus on the discovery of new forms. To reduce the case to an absurdity, he mentioned the erection of two genera, Eutyphlus LeConte and Nicotheus Casey, which afterwards were proved to be different sexes of the same species. That was a case, he said, where the generic characters unquestionably had to be enlarged. Dr. Gill said that the point raised led at once into a discussion of very broad scope and involved questions as to what genera really are and what characters are to be used for genera. He stated that the fact of great diversity in the sexes may itself be used as a generic character. The mere fact of cecity, in his opinion, is not valuable as a generic character, and he very much doubted the expediency of using such a physiological character, since some species have a tendency to become blind under certain circumstances. He referred to a blind catfish which occurs in caves in Pennsylvania and which is very closely allied to surface forms. Cope and formerly Jordan considered this a distinct genus. He, however, always considered it a true *Amiurus*, nearly related to the common *A. melas*, and recently Dr. Jordan has changed his opinion and now agrees with Dr. Gill.

As to Hemimerus (mentioned by Mr. Cook), Dr. Gill expressed himself as believing that it is undoubtedly the representative of a very isolated family, but whether it should be given higher rank depends upon the determination of the actual characters and upon the value which should be given to such characters. The first point he illustrated by the fact that the interpretations of the mouth-parts made originally by Saussure have been attacked by Hansen.

Mr. Schwarz, as illustrating the rapidity with which surface forms may assume cave-inhabiting characteristics, mentioned the case recently described in the Bulletin of the Museum of Natural History, of Paris, in which a Trechus found in the catacombs of

Paris had become nearly blind and taken on more or less of a resemblance of an Anophthalmus. Here it could not have existed under these conditions for over 1,000 years.

Dr. Gill said that such a transformation, in his opinion, might take place in a very much shorter time—in fact, in a few generations. He referred to the cave crayfishes and their resemblance to surface forms and gave the discussion a somewhat broader scope by the statement that we may find in caves the remains of faunas which once existed, but which do not occur now in life, referring in more or less detail to the Proteus of Carniola and also to the blind bratuloid fishes of the caves of Cuba. In the latter case, we have representatives of a fauna which was once littoral, but which now exists only in the deep seas, so far as the Caribbean representatives are known, aside from these cave representatives. Distantly related species are, however, found along the coasts of other lands, but never in fresh water.

—Mr. Howard presented:

SOME NOTES ON THE PARASITES OF ORGYIA LEUCOSTIGMA.

By L. O. HOWARD.

[Author's Abstract.]

The speaker referred to the extraordinary outbreak in 1886 of *Hyphantria cunea* in the District of Columbia and to the fact that although the insect existed by millions in August of that year, so extensive was the parasitism that damage by the caterpillars was not noticed in 1887. He showed the large series of hymenopterous parasites referred to in Bulletin No. 10 of the Division of Entomology, revised edition, as illustrating the forms concerned. In 1895 an almost equally disastrous outbreak of *Orgyia leucostigma* occurred in the city of Washington. He showed that by August the hymenopterous and dipterous parasites of this species had become so abundant as to destroy probably from 60 to 70 per cent. of the larvæ and pupæ and from this fact it was anticipated that practical immunity would occur in 1896. The case, however, was slightly different from that of the Hyphantria since Orgyia hibernates in the egg-condition, the former hibernating as a pupa. Enough egg-masses from the Orgyia therefore remained to produce a very injurious second generation of caterpillars in 1896, provided there was not

a successful hibernation in numbers of the parasites. As a matter of fact, however, this was what occurred. The eggs of the Orgyia hatched in considerable number in the spring of 1896 and on account of an extremely successful hibernation of parasites the first brood was practically annihilated. The percentage of parasitism must have reached 98 or 99 per cent. In August it was difficult to find a single larva of the Orgyia. He exhibited a named series of the parasites reared, filling three Schmidt insect-boxes. He discussed at some length the interrelations of these parasites, showing the important point that while in the fall of 1895 primary parasites were by far the most abundant, during the summer of 1896 secondary or hyperparasites practically destroyed the primary parasites after their important work of exterminating the Orgyia had been accomplished. He also called attention to one or two cases of tertiary parasitism.

In discussion, Mr. Schwarz asked whether the primary parasites noticed were any of them restricted to this species or were forms which parasitized other Bombycid larvæ, and upon the response that they were all general lepidopterous parasites he suggested the sending of the surplus to Massachusetts for use against the Gypsy moth. Mr. Fernow mentioned an outbreak of *Orgyia pudibunda* nearly 20 years ago upon the Island of Ruegen in the Baltic Sea. The government expended large sums of money for two years in collecting and burning cocoons. One day, however, the overseer of this work noticed parasites issuing in numbers from the pile of cocoons which had been laid aside for burning. After examination he gave orders that the work be stopped, with the result that the insect was practically non-existent the following year and a large sum of money was saved. This brought up a general discussion on the work of parasites.

Dr. Lugger spoke of the occurrence in great numbers of a Tortricid on box elder in Minnesota. He had made his preparations for spraying, but before beginning the operation an examination showed the occurrence of parasites in force. He, therefore, did not spray and the Tortricid was reduced by its parasites to innoxious numbers. Mr. Swingle referred to a case in which he had sprayed with Bordeaux mixture in Florida,

against a fungus upon orange. To his surprise the scale-insects on the treated trees increased enormously, whereas those upon untreated trees did not increase. He discovered that by his Bordeaux spray he had destroyed a fungus parasite of the scale-insects. Mr. Schwarz referred to the fact that in 1878–'79 *Thyridopteryx ephemeræformis* was excessively abundant upon shade trees in Washington, but its parasites cleaned it off extensively and it has not been so abundant since. Hyphantria and Orgyia, however, have shorter periods of recovery from these excessive cases of parasitism.

Dr. Lugger referred further to the occurrence in great numbers, in the windbreaks in Minnesota, of the larvæ of certain of the Attacine moths. In a number of cases he had recommended the collecting of the cocoons in the winter time and placing them in boxes or barrels covered with wire gauze, the meshes being sufficiently wide to admit of the escape of parasites. In all cases where this method had been adopted for one year the silk-worms were very scarce for many miles the following season. With the army-worm the past summer in Minnesota the percentage of parasitism had been so great that he had informed farmers that remedial work would be useless, the result realizing his anticipations. Mr. Howard spoke of a similar army-worm case in Huntsville, Alabama, in 1882, and, in fact, stated that this was a common occurrence with army-worm outbreaks. Dr. Lugger further stated that the Hessian fly has made its appearance in northern Minnesota the past year or two. Its occurrence is far north of the limit line of winter wheat. Here, however, the percentage of parasitism he had found to be considerably above 90 per cent. Mr. Alwood stated that in Virginia every 5 or 6 years the Hessian fly becomes abundant but that whenever this occurs the parasites also become so abundant as to practically destroy the Cecidomyia.

Mr. Howard, apropos to Mr. Lugger's last remark, stated that it had always been considered almost an axiom that the Hessian fly, from its method of life, would not prove injurious above the line of growth of winter wheat. He said the facts detailed by Mr. Lugger indicated one of two things, either that in this locality the Hessian fly had radically changed its habit

and become single-brooded, or that some closely allied grass-inhabiting Cecidomyid had taken to wheat.

—Mr. Alwood spoke of an outbreak of *Goes pulverulenta* on the elm shade trees in the city of Richmond, Va. He described the excessively injurious work of this insect and stated that there had been a loss to the city of from $15,000 to $20,000 through its attacks on shade trees. By the cutting down of the badly infested trees and by cutting off the limbs where these only were attacked, at his advice, he considered that the damage had been arrested.

Dr. Lugger stated that some years ago the allied species *Goes pulchra* had been very abundant upon hickories near Baltimore.

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121 DECEMBER 3, 1896.

Vice-President Gill in the chair, and Messrs. Benton, Patten, Schwarz, Chittenden, Heidemann, Motter, Busck, Stiles, Johnson, Swingle, Ashmead, and Howard, also present.

The following new corresponding members were elected:

R. H. Pettit, St. Anthony Park, Minn.; F. A. Sirrine, Jamaica, Long Island, New York.

—Under the head of "Exhibition of Specimens," Mr. Patten showed a live specimen of *Lasioderma serricorne* taken from a box of Key West cigars. He also showed a cigar from which the beetles had emerged. Mr. Schwarz stated, apropos to this insect, that it does not breed in northern cigar factories and that he doubted whether it would breed in cigar shops in Washington. Mr. Howard gave an instance which had come under his observation in which the insects were unquestionably breeding in a small cigar store in Georgetown and stated that the owner had rid his premises by the use of bisulphide of carbon.

—Mr. Ashmead exhibited some interesting specimens from a small collection of Hymenoptera made by Mr. Townsend at San Rafael, Mex. Those to which he called special attention were a species of Amiseon, *Trichaulus singularis* Mayr, *Podagrion townsendi* n. sp., *P. mantis* Ashmead (for comparison), two new species of Philanthocephalus and *Hontalia cameronii* n. sp.

—Mr. Howard exhibited specimens of *Proticerya rileyi* Cockerell, from New Mexico, on mesquite, and also a curious new Coccid collected by Messrs. Townsend and Cockerell, at Apache Agency, New Mexico, on Gutieriza. This insect Mr. Cockerell proposes to call *Crypticerya townsendi*, making Crypticerya a new sub-genus. The speaker called attention to some points of difference between this form and true Icerya and particularly the large genital orifice which is exactly in the middle of the body, and said that in his opinion it would form a new genus instead of a subgenus.

—A paper by Mr. Cockerell entitled "Miscellaneous Notes" was read by the Secretary.

MISCELLANEOUS NOTES.

By T. D. A. Cockerell.

The following notes are suggested by Proc. Ent. Soc. Wash., IV, No. 1, just to hand:

(1) Mr. Schwarz's notes on semi-tropical Texas interest me very much. I wish Mr. Ashmead would give us some information about the bees of that region. The bee-fauna of southern New Mexico is highly peculiar, with a very large percentage of new species, though it extends somewhat northward along the eastern side of the Rocky Mountains, and also westward and southward in the arid region of Mexico and Arizona. It is characterized by apparently peculiar genera, *Protandrena* and *Phileremulus*, and an enormous development of *Perdita*. There are very few *Osmia*, or *Prosopis*, or *Nomada*. All this contrasts strongly with the mountain region of Colorado, whence Cresson described so many bees. Here *Perdita* vanishes, and *Prosopis* becomes abundant, with plenty of *Osmia*, *Nomada*, &c. Lately I have examined a collection made by Prof. Townsend in Vera Cruz State, in the tierra caliente. It is totally different from the arid-region fauna, and resembles in part that of the eastern and southern U. S., and in part that of South America. There is not a single *Perdita*. *Augochlora*, rare in the arid region, is abundantly represented. *Megachile* presents many forms; *Ceratina* has developed a very beautiful species. Now what relation has the bee-fauna of semi-tropical Texas to these? It is an interesting question.

Mr. Schwarz refers also to the insect fauna of the mesquite not being uniform throughout the range of the plant. The in-

teresting Coccids found by Prof. Toumey in Arizona on mesquite are all different from the equally interesting ones found in the Mesilla Valley, New Mexico, on the same plant. Similarly, the same species of oak, which in the Organ Mts., N. M., furnishes *Kermes galliformis* and *Chionaspis quercus*, at Pinos Altos, N. M., gives us *Kermes galliformis*, *Aspidiotus ancylus*, *Aulacaspis montana* and *Olliffiella cristicola*. Such instances could be multiplied almost indefinitely. It is the same, to a considerable extent, with even the bee-visitors to the flowers. The beautiful *Melissodes luteicornis*, common at mesquite flowers at and near Rincon, N. M., I have never seen in the Mesilla Valley. A short search one day at San Marcial, N. M., gave me four species of *Perdita* on *Larrea;* the same *Larrea* abounds in the Mesilla Valley, but several times this year I looked on it for those bees, and never found one of them.

(2) *Lecaniobius cockerellii* is an important parasite of *Lecanium begoniæ*, Dougl., in Antigua; it is the species referred to in Bull. Bot. Dep. Jamaica, May, 1894, p. 70. The name *fraternum* is a MS. synonym of *begoniæ;* it was never published by me.

(3) In the discussion on *Scutellista cyanea*, this insect seems to be regarded only as a parasite of *Ceroplastes*. But Nietner records it as parasitic on *Lecanium coffeæ*, a species which is very doubtfully distinct from our common *L. hemisphæricum;* so if introduced into this country it should surely attack the latter.

(4) Mr. Ashmead states that no females of *Labidus* have been found. It is generally admitted that *Labidus* and *Eciton* are one, and some years ago M. Ernest André described a peculiar insect taken in Mexico (I believe by Dr. A. Dugès, though it is not so stated), as *Pseudodichthadia incerta*, which he surmised might be the female of *Eciton*. In a letter to me, dated August 16, 1896, M. André speaks with positive assurance of the *Pseudodichthadia* being *Eciton* (=*Labidus*), so we must consider that the ♀ *Labidus* is known, if only in a single species. M. André suggests that perhaps these females do not come to the light at all, but remain underground; he also remarks that it is possible that a nest contains but a single female.

MESILLA, N. M., Nov. 19, 1896.

In discussing this paper Mr. Ashmead said that he was perfectly aware of the conclusion of Emery and Mayr as to the identity of Eciton and Labidus, but that he had questioned this conclusion

years ago. In fact, he considers it totally wrong. In this conclusion Mr. Pergande, the best informed student of ants in America, agrees with Mr. Ashmead. Mr. Schwarz, in substantiation of this view, said that Labidus has never been found east of the arid region of the United States, whereas Eciton occurs in North Carolina. The Rev. P. Jerome Schmitt has found the female of Eciton in North Carolina, and possesses an excellent drawing of it, but although he has had it for more than two years, he has not yet published it. Referring to Mr. Cockerell's statements regarding the different bees visiting the same species of flower in different localities, Mr. Schwarz did not consider it at all significant, since no bees seem to be confined to single kinds of plants. He further mentioned Mr. Cockerell's custom of naming bees after plants which he had found them to visit, and thought that this custom was unwise. Mr. Benton agreed with the last speaker and stated that bees visit flowers for honey, and that in different atmospheric conditions the honey supply of different plants varies greatly, so that honey-collecting bees are forced, on occasion, to visit different species of plants.

—Mr. Schwarz presented the following:

NOTES ON THE LERP INSECTS (PSYLLIDÆ) OF AUSTRALIA.

By E. A. Schwarz.

For more than 60 years it has been known that there occurs on the leaves of Eucalyptus trees of Australia and Tasmania a substance called Laap or Lerp by the natives and which is used by the latter as an article of food. The first scientific investigation of one of these objects was published in 1849, in the Edinburg New Philosophical Journal,* by Dr. Anderson, who made a chemical analysis of Lerp but remained ignorant regarding its origin. In the same year Mr. Newport surmised that Lerp was the product of an insect and not a mere exudation of the plant.

In 1850 Mr. Thomas Dobson published an illustrated paper on this subject in the first volume of the Papers and Proceedings of the Royal Society of Van Diemen's Land.* A reprint, with additional figures and an appendix apparently written by "J. M.," appeared in the Transactions of the Microscopical Society (2), vol. 5, 1857, p. 123–130, under the title "On Laap, or Lerp,

* I have not seen this paper, nor is it mentioned in Hagen's Bibliotheca.

the cup-like coverings of Psyllidæ found on the leaves of certain Eucalypti." In this remarkable and often quoted paper, which still remains the most important contribution to our knowledge of this subject, Mr. Dobson proves that the Lerp objects are the cases spun by the larvæ of certain Psyllids. Three different forms of Lerp are described by him, two of the imago Psyllids figured but only one described and named *Psylla eucalypti;* the third Psyllid is only briefly mentioned.

In 1879, Dr. V. Signoret (Ann. Soc. Ent. France, Bulletin, p. LXXXV) proposed the new genus *Spondyliaspis* of the family Aleyrodidæ, founded solely upon what Signoret considered as the scale of the insect. He had seen only dried-up specimens of larvæ or pupæ found beneath these scales, and from the fact that they showed four wing-pads correctly concluded that the insects could not belong to the Coccidæ. The scales are described as being of the form of a conical shell (coquille) with a number of external ridges which are either spinous or smooth. The three species described by him (*S. spinosulus*, *cereus*, and *bancrofti*) are distinguished by the color of the shell and the number and nature of the ridges.

In 1881 (l. c., Bulletin, p. CLVIII) Signoret returns to this subject and states that his genus Spondyliaspis was identical with Maskell's genus Inglisia, described as a Coccid.

In 1883 Mr. J. G. Otto Tepper (Journ. Linn. Soc., 17, No. 99, p. 109) published some "Remarks on the Manna or Lerp Insect of South Australia" in which he confirms Mr. Dobson's discovery regarding the origin of lerp.

In 1891 (Internal. Journ. Microscopy, 3rd series, vol. I, No 3, p. 87) appeared, without indication as to the author, a figure of a specimen of lerp which is apparently identical with one of the lerps figured by Dobson; the few lines of text accompanying this figure do not convey new information.

According to the minutes of the Proceedings of Linn. Soc. New South Wales (2), vol. IX, November 28, 1894, Mr. A. Sidney Olliff exhibited a Psylla from West Australia "which makes elongate semi-transparent, horny larval coverings on the foliage of *Eucalyptus rudis*. In structure and habits it is closely related to *Psylla eucalypti*, and it is proposed by Mr. Olliff to call it *Psylla periculosa*." No description of this species has ever been published.

Finally, in 1896, Mr. W. M. Maskell in his Monograph of the Aleurodidæ (Trans. New Zealand Institute, vol. 38, p. 411) vigorously objects to Signoret's interpretation of his genus Inglisia which is a true Coccid, and adds that from specimens received from Signoret himself there was no doubt that the genus

Spondyliaspis Sign. was identical with some of the Lerp Psyllids described by Dobson. In this statement Mr. Maskell is no doubt correct.

To sum up our knowledge of Lerp insects, there are, in Australia and Tasmania, various, probably many, species of Psyllidæ the larvæ of which construct cases of remarkable shape and often great beauty on the leaves of Eucalyptus trees. These structures are not merely waxy excretions which harden upon exposure to the air, but they are spun by the larva, each case being inhabited and constructed by a single larva. Regarding the mode of growth or rather the mode of enlarging of the cases by the larva we know very little beyond the statements in Dobson's paper; in fact the entire biology of these interesting insects is but imperfectly understood. I have seen myself only a few lerp cases collected by Mr. A. Koebele during his first trip to Australia, and which are now preserved in the collection of the U. S. Department of Agriculture, but among the numerous imago Psyllids found by him on Eucalyptus trees there are two species which are unquestionably congeneric with Dobson's *Psylla eucalypti* although they radically differ from the genus Psylla of modern authors. The lerp from which Dobson obtained his species evidently agrees structurally with that upon which Signoret established his genus Spondyliaspis, and it seems to me that we have to adopt this name although the genus has been founded solely upon characters derived from the cases constructed by the larva. The following is a description founded upon characters of the perfect insect.

Spondyliaspis Signoret.

Body slender, dorsal surface very little convex longitudinally; head hardly deflexed, surface flattened; vertex gradually narrowing each side at the insertion of the antennæ, along the median line much longer than half its width at base; frontal processes very long, cylindrical, parallel porrect and abruptly depressed below the level of the vertex; eyes large, convex, projecting laterally; tempora slightly developed; anterior ocellus visible from above; antennæ long, filiform, third joint the longest.

Pronotum large, very little convex laterally, truncate in front, slightly emarginate behind, lateral impressions distinct; dorsulum transverse, not longer than the pronotum, equally moderately lobed in front and behind.

Fore-wings membranous, very long, narrow, widest a little beyond the middle, very gradually narrowing apically, tip angulated or narrowly rounded; veins moderately fine: cubitus distinctly longer than the discoidal part of subcosta, a long but narrow pterostigma, radius slightly arching throughout its length and terminating in the tip of the wing, stem

of second fork parallel with radius, cells of normal form, the marginal cells not greatly different in size.

Legs short, anterior and middle tibiæ simple, posterior tibiæ not dentate at base, but dilated at apex and produced near the outer (posterior) apical angle into a stout mucro; anterior and middle tarsi with the first joint short, simple, and much longer than the claw joint, posterior tarsi with the first joint as long as the claw joint and dilated beneath into a broad, flattened, membranous cushion-like disk; metasternal epimera very large; as long as wide, without spiniform processes.

Sixth ventral segment of the male broadly divided for the reception of the genital segment, genital plate and forceps without lateral appendages, genital segment of the female not beak-shaped, the outer valves consisting of two short plates.

Spondyliaspis eucalypti Dobson (?)—General color greenish or ocherous-yellow, frontal processes often roseate except at base and tip, sides of vertex and pronotum light brownish or roseate, dorsulum with a pale median line and often margined with brown or black; abdomen above usually blackish, the segments margined behind with green, or red, or yellow, underside pale yellow or greenish, side pieces of mesonotum bordered with black, upper edge of fore and middle femora often brownish.

Head porrect or very little inclined, truncate behind; vertex along the median line much longer than on the sides, and also much longer than half its width at base, sides parallel between the eyes, then angulated and gradually narrowing and triangularly produced, front edge rather acute, discal impressions very conspicuous and of dark color, frontal processes abruptedly depressed below the level of the vertex and a little more inclined, slightly longer than the vertex along its median line, cylindrical, not divergent but not contiguous, hairy; tempora visible behind the eyes and forming a distinct angle with the hind margin of the head; antennæ reaching to the end of the body, 3rd joint one-third longer than the 4th, joints 4–8 slender, very slightly decreasing in length, joints 9 and 10 together a little shorter than the 8th; clypeus knob-shaped, beak hardly projecting above the coxæ.

Pronotum a little more than half the length of the vertex and about as long as the dorsulum, very little convex transversally, often with a fine median line; dorsulum twice wider than long, its front margin overlapped by the dorsulum, color very variable but apparently never with decided darker markings.

Fore-wings hyaline or slightly whitish, veins fine, brownish, basal and discoidal parts of subcosta piceous and much stronger than the other veins; pterostigma very long, closed, tolerably wide at base; radius parallel with costa except near its terminus, very slightly and evenly arched; stem of second fork parallel with radius and forming no angle with the fourth furcal; stem of first fork more than twice shorter than that of second fork, and slightly longer than the cubitus; first furcal slightly shorter

than the stem, terminating obliquely upon the costa and two and one-half times shorter than the second furcal, with which it forms an oblique angle; second furcal gently curved throughout its length and terminating obliquely upon the costa; third furcal slightly shorter than the fourth, which is about as long as the second furcal; radial cell slightly narrower than the discoidal cell. which is nearly of the same width as the cubital cell, the latter not narrowed at middle; margin of anterior basal cell flattened out, limited internally by a fine vein; brachium reaching the apical corner of the posterior basal cell.

♂ Genital segment very large, completely dividing the sixth ventral segment, honey-yellow, plate and forceps usually darker; genital plate longer than the segment, perfectly straight, about three times longer than wide, not narrowing apically, broadly rounded at tip; forceps much narrower and but little lower than the plate, its front edge slightly concave at basal half and convex at apical third, its posterior edge nearly straight, tip acute and pointing backward.

♀ Only four ventral segments are visible in addition to the genital segment; the latter consisting of two very short plates which (at least in dried specimens) do not meet; upper plate as long as the preceding ventral segment, either horizontally projecting or declivous, broadly rounded at tip, lower plate only half the length of the upper one, rapidly narrowing into an extremely small acute point, lower edge convex.

Length (to tip of wings) 3.50–4 mm.

Described from several specimens collected by Mr. Albert Koebele on *Eucalyptus leucoxylon* in Australia (probably South Australia). Specimens typical of the above description are in the U. S. National Museum (collection Department of Agriculture), No. 3793.

The genus Spondyliaspis differs from all Psyllid genera known to me by the peculiar structure of the hind tibiæ and hind tarsi, and since it seems to me that these characters possess more than generic value, the erection of a new subfamily, Spondyliaspinæ, of the true Psyllidæ (as contrasted with the Liviidæ) is proposed for this genus. The tarsal peculiarity has already been observed by Dobson, who refers to it in the following words: "The feet are furnished with two hooks and a small membranous bladder. These vesicular appendages, as well as the antennæ, are continually in motion." In the dried specimens the cushion-like expansion of the hind tarsus is probably much less conspicuous than in the living ones. In the shape of the body this genus bears a considerable resemblance to the genus Flohria Lœw, of the tribe Psyllini.

There is, of course, considerable doubt as to the specific identity of this species with Dobson's *Psylla eucalypti*, the imago of which is described only in a general way, but I am

unwilling to introduce a new name in view of the possibility that one of the three specific names proposed by Signoret for larval cases may be applicable. The synonymy of these Lerp Psyllids will remain in an unsettled condition as long as the life-history of each species is not properly known. Dobson's species were collected near Hobart Town, Tasmania; Signoret's larval cases come from Brisbane, while Koebele's Australian Psyllidæ are unfortunately without precise locality. Among Koebele's material there is a second species of Spondyliaspis, but represented only by a few specimens.

What appears to be an undescribed genus of Lerp Psyllids is represented among Koebele's material by several species, one of which has been bred by him from its larval case. The latter evidently belongs to the third form of lerp described by Dobson, and is apparently referred to in Intern. Journ. Microscopy, 1891, p. 87, as "exquisite examples of miniature basket work." Dobson speaks of it as "surpassing in beauty and structural development the species already described. Its form is remarkable, like to that of one valve of cockle shell." With its edge the shell rests upon the surface of the leaf, but only the "hinge," or posterior vertical side, is firmly attached thereto. In the specimens before me the hinge is the only solid part of the structure, apparently wax-like in texture, of a yellowish-white color at the base and reddish at the outer circumference. The rest of the structure consists entirely of open basket work, the longitudinal threads radiating from the hinge and symmetrically arching over until they reach the surface of the leaf. In one of the specimens I count 28 of these threads, which are yellowish white at their base, where they are close together, and of reddish color on the roof and anterior side of the shell. The transverse threads are much finer than the longitudinal ones, of the same coloration as the latter, closely approximated near the hinge and forming with the longitudinal threads quadrate or transverse meshes. The entire shell is unproportionally large for the size of the insect, but I suppose that the larva or pupa inhabiting the same is covered with a copious layer of woolly excretion which entirely fills the case. The solid part of the hinge I take to represent the first stage of the structure exuded by the larva and which, like a scale, rests flat upon the leaf; the reddish portion of the hinge, the whitish and reddish portions of the threads probably represent the successive stages in the construction of the lerp.

The imagoes bred from this lerp are more gaily colored but much less remarkable in structure than the species of Spondyliaspis. In describing one of the species I gladly accept for it the very appropriate generic name kindly proposed by Dr. Th. N. Gill.

CARDIASPIS nov. gen.

Body stout, head vertical, pronotum and dorsulum strongly ascending posteriorly; head emarginate posteriorly, vertex flat, sinuately narrowing each side at the insertion of the antennæ, its front edge slightly triangularly produced each side of the anterior ocellus; frontal processes sharply separated from the vertex, slightly depressed below its level and represented by two large, slightly transverse lobes which are contiguous along the median line and shorter than the vertex; antennæ stout, slightly longer than the width of the head (including the eyes), third joint slightly longer than the fourth; eyes large, globular, projecting slightly beyond the sides of the pronotum and occupying the entire side of the head; tempora not developed; anterior ocellus not visible from above on account of the vertical position of the head.

Pronotum greatly convex transversely, lateral impressions large and deep; dorsulum at middle nearly twice shorter than its width and less than twice the length of the pronotum; its anterior margin distinctly more arched than the posterior margin; mesonotum very little convex longitudinally; side pieces of pro- and mesosternum bulging and very prominent.

Anterior wings hyaline, elongate-oval, nearly twice as long as the body, transparent, at apical third very little wider than at middle, thence gradually narrowing to the apex, which is rather narrowly rounded; veins fine, none of them much curving, petiolus cubiti distinctly longer than the discoidal part of the subcosta, a large pterostigma, tip of wing at the termination of the fourth furcal; cells of normal shape, anterior basal cell deeply concave, with a wide, flattened margin, marginal cells moderately large, the second distinctly larger than the first.

Epimera of metasternum greatly developed, transverse, spiniform processes very small, vertical. Legs short and robust, hind tibiæ without basal tooth, tarsi normal.

Following Dr. Fr. Loew's arrangements of Psyllidæ, this genus belongs to the subfamily Psyllinæ and the tribe Aphalarini. It is distinguished from all described genera of this tribe by its vertical head and the form of the frontal processes.

Cardiaspis artifex n. sp.—Color of upper side pale ochre-yellow with reddish or reddish-brown markings of variable extent and intensity; frontal processes usually bright red; abdomen above usually blackish, each segment margined behind with red or yellow; antennæ pale; side pieces of sternum sometimes bright red; legs pale, femora dusky; epimera of metasternum pale. Vertex along the median line distinctly longer than half its width at base, discal impressions large, black; frontal processes three-fourths as long as the vertex at middle, each process subquadrate with the apical edge slightly obliquely truncate; antennæ slightly longer than the width of the head, second joint quadrate, third joint but slightly longer

than the fourth, joints 5–8 subequal in length, each nearly as long as the fourth, joints 9 and 10 almost connate, together decidedly longer than the eighth.

Pronotum half as long as the vertex at middle, pale, with a fine black median line; dorsulum pale at base and on the sides, anteriorly with a large reddish or light brownish spot which is sometimes divided; mesonotum very little convex longitudinally, pale, with a fine, dark, median line, and on each side thereof with two wide brownish or reddish stripes.

Anterior wings slightly whitish, at tip not quite regularly rounded, the greater part of the curvature being formed by the posterior margin; veins reddish at the basal portion of the wing, more yellowish apically; cubitus about one-fifth longer than the discoidal part of subcosta; pterostigma elongate-triangular, closed in front, slightly more opaque than the rest of the wing; radius very slightly arching, forming a very oblique angle with the radial part of subcosta; stem of second fork parallel with radius and nearly twice as long as the stem of first fork; first furcal more than twice shorter than the second, and terminating obliquely upon the costa; second furcal nearly straight, about as long as the fourth, and terminating very obliquely upon the costa; third furcal distinctly shorter than the fourth, which runs into the tip of the wing and forms a hardly perceptible angle with its stem; first marginal cell more than twice longer than high, second marginal cell much higher than its width at the margin. Abdomen very robust, slightly widening apically.

Male, unknown.

Female: Genital segment very short and not beak-like; upper genital plate broad, slightly longer than wide at base, moderately declivous, narrowing posteriorly, and broadly rounded at apex; lower plate represented by a very short, transverse band which is widely emarginate behind.

Length, to tip of wings, 3.2–3.5 mm.

Type, No. 3794, U. S. National Museum (collection U. S. Dept. of Agriculture).

Hab., South Australia, on *Eucalyptus leucoxylon* (A. Kœbele).

Described from three female specimens, in which the abdominal structure cannot be fully studied. From a male of another species of this genus which is before me in some ill-preserved specimens, it can be seen that both the genital plate and the forceps are simple and straight, the latter narrower and higher than the former.

In discussion Mr. Howard referred to the adoption by Mr. Schwarz of the generic name Spondyliaspis of Signoret and questioned whether it was necessary or even advisable to adopt a name under such circumstances. He introduced as a practi-

cally parallel case the following supposition: Suppose the excrement of a turtle were found and described by some careless worker as a new genus of earth-worms. That it was subsequently ascertained that it was not an earth-worm but the excrement of a turtle. That, long after, the turtle which voided the excrement was discovered and found to be a new genus. Would it be considered necessary or advisable to apply the generic name of the supposititious earth-worm to the new genus of turtles?

This introduced a general and vigorous discussion of the name-carrying powers of structures or habitations produced by animals or secretions from their bodies, which was participated in by Messrs. Gill, Stiles, and Schwarz.

Dr. Stiles stated that, in general terms, names in zoology apply to organized beings and not to their inorganic surroundings. Mr. Schwarz took issue with this statement, instancing the case of Helicopsyche among the Trichoptera, Coleophora among the Lepidoptera, and the galls of Pachypsylla, where the case or gall is more distinctive and characteristic of the species than any morphological structures which can be discovered. Dr. Gill was of opinion that the name may be given to a structure like a case if there is strict co-ordination between the animal and its case. He instanced the description of a larval case of a Phryganeid as a new genus of mollusks by Lea and Swainson. Mr. Howard suggested that in the shells of mollusks we have an instance somewhat comparable with the case of an insect larva, and certainly many mollusks have been described from their shells alone. Dr. Stiles stated that the shell indicates the shape of the animal, and is, therefore, to some extent, an indication of its morphology. Purely excrementitious matter, however, cannot be said, except in rare instances, to indicate morphological features. The cases of an insect larva in so much as they indicate shape and size of the larva may be said to be indicative of morphological character.

Dr. Gill stated that we have many precedents for such names. The classification of spiders, for example, long depended in some of its main features upon the shape of the web. The shells of mollusks do not correspond to the shape of the animal, as a whole, but, as with the Gastropods, to the bulk of the intestinal

canal as a mass, and with the Lamellibranchs to the mantel lobes and their extensibility. In these cases we have, however, an expression of structural features in the animal and this he thinks to be the case even with the genus Spondyliaspis. He would, therefore, accept names in this class. In cuttle-fishes, for example, we have forms distinguished by the pen, which is an excretion. He referred also to the Coprolites or fossil dung of extinct animals as being in certain cases expressions of structure. He thought that the subject of excreta has been too much overlooked, and referred to the widely differing dung of the domestic animals as an example.

Mr. Schwarz stated that he would not recommend the erection of genera upon larval cases, but he believes in using in diagnoses every character, whether morphological or not, which can be defined. Referring to excreta, he stated that Dr. Hagen had made a very interesting collection of the excremental pellets of Lepidopterous larvæ, many of them being specially characteristic.

Mr. Howard, referring to Signoret's error in considering Inglisia synonymical with Spondyliaspis, said that he had in a joint article with the late Dr. Riley unfortunately followed Signoret's error, and that Mr. Maskell, in his Aleyrodid paper referred to by Mr. Schwarz, had evidently supposed that Dr. Riley and the speaker were responsible for the suggestion of the synonymy. Maskell apparently had overlooked Signoret's 1881 note.

—The following paper, by Mr. Chittenden, was read by title:

ON THE PARASITES OF ADULT COLEOPTERA.

By F. H. Chittenden.

SARCOPHAGID PARASITE OF AN ADULT CARABID.

During June of 1894, Mr. Theo. Pergande captured an adult of the common carabid beetle, *Scarites subterraneus*, from which soon afterward a living larva issued. For some reason the parasite was not reared, although nearly a score of the beetles were confined in a rearing-jar for this purpose. Mr. Pergande was of the opinion that the parasite would not be so apt to be found in beetles under stones as in those that might be taken in

roads and pathways. At his suggestion I kept a lookout for the insect and on the 1st of July succeeded in securing a specimen running across a roadway from which was reared the parasite.

July 5, a large, fleshy maggot crawled out of the body of its host, which was now dead, and on being placed in a jar of moist earth it at once burrowed downward and disappeared. On the 18th of the same month the fly issued from the puparium. At 9.30 A. M., when first noticed, its wings were still unexpanded, but in half an hour, when next examined, the insect had fully matured.

It has been identified by Mr. D. W. Coquillett as belonging to the true genus Sarcophaga as at present constituted, a group in which the species are not well understood.

This is, so far as I am able to learn, the first instance of a sarcophagid parasite having been reared from a living adult beetle. Instances, however, are not lacking of somewhat similar habits in this group. I have at hand a reference cited by Brauer of a European species closely related to Sarcophaga, viz., *Blæsoxipha grylloctena* Loew, having bred from the bodies of *Pezotettix alpinus* and other Acridiidæ. Our common *Sarcophaga carnaria* Linn., which is common to both the old and new worlds, has been reared from dead adults of *Oryctes nasicornis* and *Polyphylla fullo*, and it may be interesting to note in this connection the rearing of another sarcophagid, *Helicobia helicis* Towns., from the dead body of *Allorhina nitida*. Two flies issued July 27, 1895, Washington, D. C. It has previously been recorded as bred from Lachnosterna (Psyche, vol. VI, p. 468), but there is no mention as to whether the host was living or dead. The decomposing bodies of the larger Scarabæidæ emit an unusually powerful stench, especially such as are washed up on the shores of lakes or other bodies of water, and it would seem that they are particularly attractive to the carrion-feeding sarcophagids.

Just what attracts the parasitic Sarcophaga to the living Scarites it would be interesting to know. Can it be possible that the parasitized individuals are diseased?

There is in the National collection a series of the tachinid *Eutrixa masuria* Walk. bred from the adult of *Lachnosterna arcuata* at Washington, D. C., in March, 1895.

The tachinid parasite of the adult of *Calosoma peregrinator* Guer. mentioned by Mr. Coquillett in Insect Life (vol. II, p. 234) has since been identified by him as *Biomyia georgiæ* Br. and Berg. This species has also been reared from *Calosoma calidum* and is mentioned in the report on the gypsy moth published in January, 1897 (p. 83) as *Pseudotrætocera calosomæ* Coq. (MSS.).

BRACONID PARASITE OF ADULT COCCINELLIDÆ.

In the first volume of Insect Life (pp. 101–104) the late Dr. Riley gave an interesting account of a parasite of the spotted ladybird, *Megilla maculata* DeG., the initial paragraph of which reads: "Up to the present time no parasite of adult Coccinellidæ have been recorded in this country." A brief mention of this same parasite published ten years earlier was evidently overlooked. It is by Townend Glover and appeared in the Annual Report of the Commissioner of Agriculture for the year 1877, as follows: "A parasitic insect attacks the *Hippodamia* (*Coccinella*) *maculata* (Fig. 43), or spotted ladybird, in a very similar manner, [to Aphidius or Trioxys infesting plant-lice] and was taken in Maryland."

Glover's illustration is perfectly recognizable as the same species figured by Dr. Riley, and Mr. Ashmead expresses the opinion that it will prove to be identical with the *Microctonus* (*Dinocamptus*) *terminatus* Wesm. of which Ratzeburg has given a good account in his Ichneumonen der Forstinsecten (vol. III, p. 61).

FIG 2.—*Megilla maculata*, parasitized [from INSECT LIFE.]

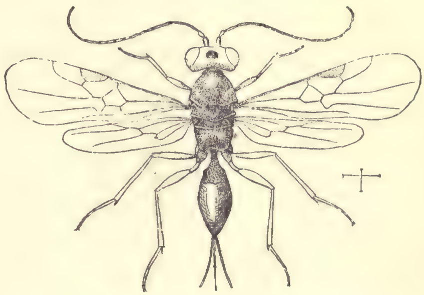

FIG. 3.—*Perilitus americana* [from INSECT LIFE.]

It was reared from *Coccinella 7-punctata* and *C. 5-punctata*, common European ladybirds not known in this country. Dr. Riley gave a translation of Ratzeburg's notes and proposed for the American specimens the provisional name of *Centistes americana*, afterwards describing it (l. c., p. 338) as *Perilitus americanus*.

In June, 1891, there were received at the Division of Entomology, from the Death Valley Expedition, several living specimens of *Hippodamia 5-signata* Kirby, with the statement that they had been found in great abundance on Mt. Magruder, in Nevada, at a high altitude above snow line. Being desirous of studying

their habits several specimens were kept alive, and in due time a parasitic larva issued and spun up its cocoon. The host was dead when discovered, but there is little doubt that in nature it clasped the cocoon as is the habit of *Megilla maculata*, and stood over it until death ensued. A few days later the perfect insect appeared and, on being referred to Mr. Ashmead, was pronounced after careful comparison with Mr. Cresson's type in the collection of the American Entomological Society, of Philadelphia, and with the published description, to be *Euphorus sculptus*, which was described by Cresson a quarter of a century ago from a single specimen from Illinois. (Can. Ent., vol. IV, p. 227.)

In the year 1892 Mr. Coquillett reared this same species from "yellow ladybirds with six elytral black spots," imported from Australia to California, as reported in Bulletin No. 30, Division of Entomology (pp. 15–16). *Hippodamia convergens* and *Coccinella sanguinea*, common to both the western and eastern sides of our continent, are also mentioned as hosts of this parasite. The Australian host is now identified as *Coccinella repanda* Muls.

The year following, Mr. Koebele recorded the following hosts: *Hippodamia spuria*, *H. parenthesis*, *Coccinella juliana*, and *Adalia frigida* (Insect Life, vol. VI, p. 14).

A PARASITE OF ADULT SCOLYTIDÆ.

A minute chalcidid of the subfamily Entedoninæ was reared by the writer, June 18, 1894, from an adult of the scolytid *Phlœotribus frontalis* Ol. and described by Mr. Ashmead under the name *Secodes phlœotribi* (Trans. Am. Ent. Soc., vol. XXIII, p. 233). What is with little doubt the same species has been reared by Mr. A. D. Hopkins from the adult of *Pityophthorus minutissimus* and by the writer from *Chramesus icoriæ*. From the latter species the parasite issued through a round hole that occupied nearly the entire dorsal surface of the prothorax of its host.

TACHINID PARASITES OF ADULT CHRYSOMELIDÆ.

June 15 a dipterous parasitic puparium was found in a vial in which was confined an adult of the flea-beetle, *Disonycha xanthomelæna* Dalm. The puparium was fresh, having just been formed, as the beetle, then dead, had been noticed living the day previous. June 26 the adult fly issued, having passed 11 days as pupa.

The bred specimen was referred to Mr. Coquillett, who

identified it as the tachinid, *Hypostena barbata* Coq., described from New Hampshire and Southern California (Jour. N. Y. Ent. Soc., v. III, p. 57), and not previously reared.

This case is paralleled by that of the tachinid which is parasitic on Diabrotica. This species, referred to *Celatoria diabroticæ*, was first observed by the late Dr. Hy. Shimer in 1870 preying upon the striped cucumber-beetle, *Diabrotica vittata* Fab., and an account of it was given in volume V of the American Naturalist (p. 219), where it is described under the name *Tachina* (*Melanosphora*) *diabroticæ*. This parasite is quite common about Washington and has been reared from the adult beetles by the writer and others from July to September. *Celatoria crawii* Coq., described from specimens reared in California from *Diabrotica soror* (Insect Life, vol. II, pp. 233–236) is a synonym. It has also been reared from *Diabrotica 12-punctata*.

OTHER PARASITES OF ADULT BEETLES.

The subject of the parasitism of the adult of *Eleodes suturalis*, a large western tenebrionid, has been discussed by Dr. Riley in former meetings of this Society (Proceedings, vol. II, pp. 211, 219).

Anomæa laticlavia, a common chrysomelid that affects leguminous plants chiefly, is also parasitized in the adult state, the writer having seen a larva that had crawled out of the body of this beetle.

Of interest as having some bearing on this subject is an observation made upon one of the parasites of *Tyloderma foveolatum*. A larva of one of these parasites, presumably *Eurytoma tylodermatis* or *Catolaccus tylodermæ*, was observed, September 3, fastened to a newly transformed adult of the curculionid. All other parasitic larvæ were attached to the larvæ or pupæ of their host.

Dr. Fitch once observed "a minute chalcidian parasite in the act of ovipositing in the tip of the body of the female" of the flea-beetle, *Psylliodes punctulata* (Tenth N. Y. Rept., p. 39).

122

JANUARY 7, 1897.

President Marlatt in the chair and Messrs. Schwarz, Linell, Stiles, Benton, Busck, Heidemann, Gill, Banks, Ashmead, Smith, Hopkins, Woods, and Howard also present.

Mr. G. W. Kirkaldy, of Wimbledon, England, was elected a corresponding member.

—Under the head of "Short Notes and Exhibition of Specimens," Mr. Ashmead showed the agamous female of *Belenocnema treatæ* Mayr. The true sexual generation consists of winged males and females issuing from galls on the roots of live oak, while the agamous generation consists of subapterous females issuing from a gall which occurs on the leaves. Mr. Ashmead has connected the two galls simply from the study of structural characters.

—Mr. Howard exhibited a peculiar Coccid received from Mr. Otoji Takahashi, of Tokio, Japan. It occurs upon a Ligustrum and in such masses and with so much wax that the surface of the twig is completely covered. The insects are immature forms of some Lecaniine.

—Dr. Smith presented a communication, of which the folowing is an abstract:

A CLASSIFICATION OF THE ORDERS OF INSECTS.

By J. B. Smith.

[Author's Abstract.*]

The speaker proposes to divide the true Insecta primarily into two series upon the character of the mouth-parts, making one a suctorial type, to contain the orders *Thysanura* and *Rhyngota*. All the others are mandibulate in some stage of their existence. These mandibulata he divides into three other series according to the development of the prothorax. In one case the prothorax is entirely free in the adult and this series contains the *Dermaptera* and *Coleoptera*, in which the hind wings are transversely folded, and the *Plecoptera*, *Platyptera*, and *Orthoptera*, in which the hind wings are longitudinally folded beneath the primaries.

The second series is that in which the prothorax is fairly well developed, but is quite closely attached at its base to the other segments and is not freely movable as in the case of the first series. In this branch, which was terrestrial from the start, are included the *Isoptera*, *Mallophaga*, *Corrodentia*, and *Neuroptera*.

The third series had the prothorax reduced in size from the beginning, and always united to the other thoracic segments, the general tendency being towards a complete loss of function of all save the legs in this part. All the members of this series are from an aquatic form, and they include the *Odonata*,

*The paper is published in Science (2), vol. 5, 1897, pp. 671–677.

Ephemerida, *Trichoptera*, *Lepidoptera*, *Mecoptera*, *Siphonaptera*, *Diptera*, and *Hymenoptera*. From the *Neuroptera*, as generally understood, he separates the *Sialidæ*, which he makes, with its relatives, an order under the term *Platyptera*.

The paper was discussed by Messrs. Banks, Gill, and Ashmead. Mr. Bank's remarks were critical as to certain details.

Dr. Gill criticised the form of illustrative diagram used by Dr. Smith and referred briefly to Hæckel's general classification of the animal kingdom which has just been published. Mr. Ashmead also criticised certain details, but expressed himself as agreeing rather closely with Dr. Smith's general conclusions. Dr. Gill further stated that in his opinion the brain will eventually be used as a basis for classification as in other groups, referring to recent work in this direction by Viallanes.

—Mr. Hopkins presented a paper of which he has submitted the following abstract:

NOTES ON SCOLYTIDÆ, WITH DESCRIPTIONS OF NEW SPECIES.

By A. D. Hopkins.

[Author's Abstract.]

The speaker described the adult of *Pityophthorus frontalis* n. sp., and also described its galleries. It infests dead oak twigs on living trees of the red, black, and swamp oaks. He also described the adult and the galleries of *Pityophthorus fagi* n. sp., which infests beech twigs. He further described *Thysanoes querciperda* n. sp., and *T. obscurus* n. sp., the former infesting oak twigs and the latter hickory twigs. With regard to the genus Micracis, he showed that the secondary sexual characters are reversed from LeConte's descriptions.

Mr. Schwarz congratulated Dr. Hopkins upon his discoveries and spoke particularly of the extraordinary invasion of *Dendroctonus frontalis* into the pine forests of West Virginia and surrounding States, stating that in his opinion it was one of the most interesting phenomena of recent times. A rare species suddenly made its appearance, spread like wild fire for two years and disappeared like a stroke of lightning! He was

sorry that thorough investigation as to the cause of disappearance had not been made. He considered that it was probably a case of a distinctively southern insect having been brought up in great numbers from the south in yellow pine timber, spreading rapidly in the forests and killed off by an unusually severe winter.

Mr. Hopkins stated that in his opinion the insect could by no means be called a southern species since it extends to the Lake Superior region and from California to the Atlantic Coast. From the studies which he had given the matter of sudden disappearance he is inclined to think that the insect was killed off by some fungus or bacterial disease.

FEBRUARY 4, 1897.

President Marlatt in the chair and Messrs. Schwarz, Ashmead, Chittenden, Banks, Wait, Gill, Fernow, Motter, J. B. Thompson, Busck, Kenyon, E. C. Barnard, and Howard also present.

—President Marlatt delivered his annual address, as follows:

ANNUAL ADDRESS OF THE PRESIDENT.

A BRIEF HISTORICAL SURVEY OF THE SCIENCE OF ENTOMOLOGY, WITH AN ESTIMATE OF WHAT HAS BEEN, AND WHAT REMAINS TO BE, ACCOMPLISHED.

By C. L. Marlatt.

It is not an infrequent custom, in addresses of this sort, to make them an opportunity of "taking stock" of the progress for the year or for greater periods. I will not deviate from this course, but will take a little broader view than is ordinarily done, even at the risk of being considered presumptuous and with a vivid appreciation of the fact that such a summary as I hope to make would be far better done by some of our members who are older and more familiar with the literature and history of the science of entomology than is the writer.

In the midst of our own daily activities, time rarely offers to stand aside and, from some vantage point, take a glance backward along the road of progress or forward toward the ultimate goal of complete knowledge; and were it not for occasions like the present, reviews of the past or predictions of the future, useful and serviceable as they may be, would seldom find place. Viewed as a matter of history, the science of entomology appears, from our point of outlook, as a column or throng of workers, the rear ranks of which are continually dissolving and the vanguard, receiving constant additions,—the one hoary with age and venerated for things achieved, and the other vigorous with youth but with possibilities undemonstrated. To sum up briefly what this figurative column has accomplished and what the future has for it to do is the task which I have this evening assigned myself.

To attempt a complete survey, with the time at my disposal, would be altogether impracticable, nor, indeed, is it necessary. Several distinct phases of the progress of the science of entomology have been in fact already thus reviewed. In a presidential

address delivered before this Society in January, 1890, Mr. Schwarz gave a comprehensive catalogue of the North American publications on entomology and the general status of the work on this side of the Atlantic. A similar account of American achievement has also been given by Dr. Lintner. The very extensive field of applied or economic entomology was covered most fully and for all countries by Dr. Howard in a presidential address before the Sixth Annual Meeting of the Association of Economic Entomologists, August, 1894.

The general subject, however, of the history of the study of insects and of the persons who have been most prominent in such work has not been so recently discussed. The great desirability of a comprehensive historical work of the nature outlined is appreciated by all entomologists and would be of the very greatest advantage to all students. Such a work, however, means a vast amount of study and delving into old libraries and musty volumes, and, indeed, the facts relative to the biography of many of the older entomologists are very meager and many of their works are lost or almost inaccessible; but the interest which always attaches to the beginning of things will more than repay the laborious researches necessary to gain a fuller knowledge of the founders of the science. As one approaches the later history the material is much more abundant and less difficulty will be experienced. It is earnestly hoped that some of our entomologists will undertake something of this kind in the near future What I shall present on this occasion will be a very brief review of the records and individuals who have made the science of entomology, and, without hoping to give anything new or original, if I can present a picture, however imperfect, of the history of the study of insects, and direct your thoughts for the moment to some of the more important persons and periods which have characterized the development of the science, and also give some idea of what has been accomplished and what remains to be done in the future, my purpose will have been effected.

History of the Science of Entomology.

In considering the history of entomology I shall dwell more particularly on the records of the earlier centuries, and move much more rapidly over the later periods.

The sources from which the facts, dates, titles, etc., have been derived have been numerous, and careful comparisons and verifications have been made. The works themselves have been examined wherever obtainable, and among these are such interesting old compilations and memoirs as those of Pliny, Ælien Gesner-Moufet, Aldrovandi, Redi, Ray, Albin, Swammerdam, Bonnani, Roesel von Rosenhof, Johnson, Frisch, Réaumur, Sepp, and others, and many of the more modern authors. The principal later writers covering the general subject drawn upon are Latreille, Cuvier, Kirby and Spence, Lacordaire, Percheron, Burmeister, and Hagen.

When one brings together the names which are important and known to most of us in connection with our study and arranges them chronologically, they fall somewhat readily into a number of groups characterized either by well-known workers who made epochs in the science or by peculiar conditions in the world's history.

For the convenience of my present purpose, rather than as indicating necessarily well-differentiated historical periods, I have divided the writers on insects into six groups, as follows:

Group I.—The old Greek and Roman writers (350 B. C. to 100 A. D.).
" II.—The period of revival of interest in scientific subjects (1550–1650). (Authors born between 1500 and 1600.)
" III.—The Ray period (1650–1750). (Authors born between 1600 and 1700.)
" IV.—The contemporaries of Linné (1725–1775). (Authors born between 1700 and 1740.)
" V.—The pupils and the immediate followers of Linné (1775–1825). (Authors born between 1740 and 1790.)
" VI.—The period covered by the first half or three-fourths of the present century. (Authors born between 1790 and 1815.)*

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* Subsequent to the presentation of this address, in which the above classification of writers had been suggested, I came into the possession of the arrangement followed by Lacordaire, which is given below for purposes

Group I.—The Old Greek and Roman Writers.

It is more than probable that the common knowledge of every-day insects, even with the most ancient races, was almost as full and trustworthy as it is with the generality of people of our own day, if we except certain fanciful ideas as to origin, habits, etc., which for that matter are even now not at all uncommon.

The figures and sculptures of insects on the monuments of ancient Egypt, as shown by Latreille, indicate a considerable familiarity with this class of animals, and in the Scriptures all

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of comparison, and in connection therewith is introduced the grouping of authors by Kirby and Spence as illustrating chiefly the origin and growth of the accepted systematic arrangement of insects. Burmeister's grouping of the writers on Entomology is essentially by subjects and not of much service for my purpose. He uses practically but two periods: (1) writings prior to Linné (beginning with the 16th century), and (2) writings subsequent to Linné, with many subject subdivisions. The arrangement suggested by me might be modified in accordance with some of the features suggested by these other systems, perhaps with improvement, but as it suits my present purpose I have let it remain as originally given.

Lacordaire's Classification.

I. From the oldést writings to the Renaissance—period of Aristotle.
II. From the end of the 15th to the middle of the 17th centuries—period of Gesner.
III. From the middle of the 17th century to 1735—period of Swammerdam.
IV. From 1735 to 1775—period of Linné.
V. From 1775 to 1798—period of Fabricius.
VI. From 1798 to 1815—period of Latreille.
VII. "Periode actuelle" (1815–40).

Classification of Kirby and Spence.

1. The era of the ancients.
2. The era of the revival of the science after the darkness of the middle ages.
3. The era of Swammerdam and Ray, or of the *Metamorphic system.*
4. The era of Linné, or of the *Alary system.*
5. The era of Fabricius, or of the *Maxillary system.*
6. The era of Latreille, or of the *Eclectic system.*
7. The era of MacLeay, or of the *Quinary system.*

the old orders, except the Neuroptera, seem to be mentioned. In the writings of Moses, closely allied groups even are designated by name, as in his reference to the *gryllus*, *locusta*, *acheta*, and *truxalis*, which were each edible after their species.* Very ancient records occur also in the old writings of the Chinese, etc., but none of these incidental references approach in any sense a scientific consideration of the subject.

So far as we know, therefore, the first study of insects to which any importance can be attached began with Aristotle, over 300 years before Christ. Aristotle lived between 384 and 322 B. C., and his great work on the Natural History of Animals was the first important attempt of which we have any record at scientific study and classification of animals, including insects, and was the great force and authority in zoological writings until the middle of the 17th century.

It may be worth while, therefore, to examine a little more closely the ideas about insects held by this founder of the science of natural history, using for our sources of information Pliny, Réaumur, Lacordaire, and Kirby & Spence. Réaumur says of Aristotle that what he himself saw and described is usually trustworthy, but what was reported to him by other observers is often fabulous and much distorted;† and these same errors and fables were repeatedly copied by writers on insects in the later centuries. Aristotle seems to have referred in the various volumes of his history of animals to some 47 insects only, and these are designated merely generically. A classification in the modern sense he had not, but he seems to have had a more precise idea of the limits of the class Insecta than even Linné, and of the modern orders he left the *Coleoptera*, *Diptera*, and *Psychæ* (*Lepidoptera*) practically as we know them. His other general groups are more or less mixed. He appreciated the distinction between biting and sucking insects and the intermediate position held by the bees. He recognized the primary body divisions of head, trunk, and abdomen, and seemed to have fairly correct

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* Lichtenstein. Trans. Linn. Soc. (1796), vol. II, p. 51.

† Aristotle, it is reported, was very much assisted by Alexander the Great, who furthered the studies of the former both with means and with the assistance of collections of animals and observations on them obtained through the agency of his armies.

ideas of coarser anatomy. His views on the origin of insects, in which he repeated the common belief of his time, will be later discussed.

A contemporary and pupil of Aristotle's was the Greek physician and botanist Theophrastus (371–286 B. C.), an author whose writings were not especially on zoology, but who had something to say about common insects, and especially bees and honey.

With this group of ancient writers Pliny must also be placed. He lived in the first century of our era (A. D. 23–79), and his writings, so far as they relate to natural history, are similar to those of Aristotle, whom he followed closely. The only work of the many publications by this most prolific Roman author which has come down to our time in its entirety is his *Historia Naturales*, in 37 volumes, in the main a compilation. Insects are treated in the 11th book. In this he deals largely with bees, silk-worms, locusts (*Cicadæ*) and grasshoppers, spiders, and other common insects, and gives, among other items of value, some very interesting though often erroneous observations on anatomy, physiology, and habits. He insists, on general grounds, that insects breathe air, and also that, while not possessing the blood of the higher animals, they have a fluid which is its equivalent. Of classification there is even less attempt than in Aristotle. Cuvier, who has, perhaps, studied Pliny's work more closely than any other, ranks it as one of the most valuable productions of antiquity.

Various other Roman writers have discussed insects, usually bees, as Virgil, Ovid, Columella, etc., and Pliny refers to several other Greek authors whose writings are entirely lost—among them Aristomachus of Soli, who is said to have studied bees exclusively for 58 years, and Philiscus of Thasos, "who passed his life in desert spots tending swarms of bees."*

Aristotle and Pliny are practically the only ones of the "ancients" whose works are of value and accessible nowadays, and nothing important occurs after them until beyond the 16th century.†

* Bohn's Pliny, p. 8, Book XI.

† Claudius Ælianus (Ælien), a Greek physician living in the 2d century,

Réaumur has emphasized the fact that during the long period of stagnation of the middle ages the natural sciences suffered as did all other forms of learning, and nothing was added to the stock of information. When the taste for knowledge finally revived, as has been often pointed out, under the stimulus of the invention of printing, and the scattering over Europe of the Greek scholars consequent on the capture of Constantinople by the Turks, the interest in the science of entomology was again aroused, but at the time of this revival it seemed to be the belief that the ancients, notably Aristotle and Pliny, had recorded all that was to be learned, and, therefore, instead of studying nature herself, the mere copying of writings of these very old authors, and particularly of their stories and fables, was made the basis of the published works.

Group II.—Period of Revival of Interest in Science.

The charge of Réaumur's, just referred to, is descriptive of and applies to my second group of writers on entomology. Prominent among the authors of this period* (1550–1650) is the little group consisting of Gesner, Aldrovandi, Moufet, and Kircher, who were the precursors of the more careful writers of the following period of Ray and Réaumur. A few notes about these old writers may be of interest.

Conrad Gesner (1516–1565), who is styled the modern Pliny by Lacordaire, was a physician of Zurich, and compiled from the ancients a history of animals, in 3 volumes folio, supplemented with original observations and many very creditable woodcuts.

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compiled a great work, *De natura animalium*, in 17 volumes, in which insects are often discussed and in which the interesting fact is recorded that Greek anglers sometimes employed artificial insects to attract fishes. Many editions of this book have appeared, the one examined by the writer bearing the date 1611 and published in Greek and Latin text and carefully indexed—a quaint volume of more than 1,000 pages.

*A little earlier in time than this group of writers was Albertus Magnus (Groot) (1195–1289), who, on the authority of Kirby & Spence and Lacordaire, devoted one of the 21 volumes of his writings to natural history, taking the matter, as he himself confesses, from Aristotle. Insects come under the term "Anulosa," and all are "worms,"—the butterflies and flies being "flying worms," and the spiders "spider worms," etc.

Death in the plague of 1564–5 overtook him before he had completed his manuscript on insects, which thereafter had a curious and eventful history. His notes, together with those collected by Dr. Edw. Wotton, came into the possession of Dr. Thomas Penny, a physician and botanist of the age of Elizabeth who labored some 15 years to complete the compilation, dying (in 1589) before he had finished. The manuscript was later purchased by Thomas Moufet (1560–1604), a London physician, who arranged and prepared the matter, adding some 150 figures, and himself died without publishing the work. Many years afterwards the MS. came into the hands of Sir Theodore Mayerne, one of the Court Physicians of Charles I, who finally published it in 1634, nearly 100 years after it had been started by Gesner. This work, known as Moufet's *Theatrum Insectorum* ("*Insectorum sive minimorum animalium Theatrum*"), is most valuable as a compendium of all the ancient knowledge, including references to over 400 authors, and contains 500 woodcuts distributed in the text and is notable as being the first work devoted exclusively to insects.

Ulysse Aldrovandi (1522–1605), a nobleman of Bologna and professor in the University of Bologna, was an indefatigable compiler. His *Historia Naturalis*, in 14 volumes folio (1599–1640), published for the most part posthumously, treats of insects in volume IV, entitled "*De Animalibus insectis*," which was published during his lifetime (1602), and contains practically a summary of all that had been previously written on the subject. Latreille styles his work "an undigested and wearisome compilation," but, as pointed out by Lacordaire, it was a powerful influence in forming the taste for the study of insects, which later was to take a more original character. That he is not altogether a compiler, also, is suggested by his reference to himself as traversing vineyards, fields, marshes, and mountains accompanied by his draughtsman and amanuenses to draw and write whatever he wished to record (Brooks). Aldrovandi's classification of insects is based on the medium they inhabit, and in it true insects are confused with Annelids. His two main divisions are respectively terrestrial and aquatic insects, and his subdivisions, based on the number and character of the wings and feet, pretty effectively mix up the modern orders.

Athanase Kircher (1602–1680) was a father of the Society of Jesus, Rome, and was reported to be "well versed on all matters but very credulous." He was a teacher at Würzburg in 1618, and afterwards Professor of Mathematics at the Collegio Romano in Rome, and became quite celebrated for his scientific researches. He was the author of a work, *Mundus Subterranous* (Amsterdam, 1678, 7 vols.), full of marvelous tales of spontaneous origin, etc., based on "authentic observations" (Osborne). He was also evidently an enthusiastic collector, as the descriptions of his collections in the "*Museum Kircherianum*" by Bonannius and Battara indicate.*

Of the writers of this period Réaumur says they looked only to confirm what the ancients had written, and saw only what the ancients had seen, and lacked all originality, and that it was not until after the respect for and trust in the work of the ancients was lost somewhat, and doubts as to their accuracy began to obtain, that real effort was made to verify and add to knowledge.

Group III.—The Ray Period.

This brings us to the Ray period (1650–1750), or the third group of writers. The earliest of the better known names belonging to this period of doubters and original workers are Malpighi, Swammerdam, Redi, and the distinctive or epoch-making name of the period, Ray. Several of the writers of this period which does not contain many prominent names) connect the preceding period with the one under discussion.

Some of these, through ignorance, Réaumur says, perhaps were fortunately unable to read the ancients, and hence accomplished useful work. He refers in this connection to Goedart and Madam Merian.

The first step in advance was to demolish the ridiculous fables of the ancients relative to the origin of many of the smaller animals, which were held to spring from the corruption of larger

*This collection, known as the *Museo Kircheriano*, was acquired by the Government of Italy in 1870, and the writer spent an hour looking through it in the autumn of 1897 in the *Collegio Romano*, where it is still kept intact, except for the Natural History material, which has been elsewhere distributed or lost.

animals or from living or decaying plants. The honey-bee, for instance, was said to come from the carcass of a sheep or an ox; the wasp and bumble-bee from that of a horse; the Scarabæids from an ass, and a host of other insects were made to originate similarly, some from cheese, some from plants, and others from mud, mire, and ooze. Aristotle, for instance, made the butterfly originate from caterpillars, and caterpillars from cabbage leaves, and Pliny, pushing the origin a little further back, has the butterfly come from "the dew which settles on the radish leaf in the early days of the spring, but when it has been thickened by the action of the sun it becomes reduced to the size of a grain of millet. From this a small grub afterwards arises, which, at the end of three days, becomes transformed into a caterpillar," etc. (Bohn, chap. 37).

Pliny and Aristotle were both well aware that certain insects reproduced by means of eggs, or in some cases viviparously, after the coupling of the sexes. Aristotle admits this to be true of spiders, crickets, and locusts, and Pliny describes with fair accuracy the habits in this regard of spiders, scorpions, grasshoppers, cicadas, dung-beetles, and intimates as much for certain flies, bees, and ants, but in Book XI, chap. 37 (Bohn) and subsequent chapters, he repeats, with evident approval, many of the ancient ideas of the Greeks and probably also of the Phœnicians, Hebrews, and Egyptians* concerning spontaneous generation. He has various species coming from dew, earth, rotting wood, the tapeworm in man, others from carrion, the hair of man, or feathers of birds, others in filth, as fleas; from dust in wools and clothes, as the clothes moth, describing particularly the case-bearer (*pellionella*). The fig, rose, etc., engender the insects characteristic of them; sour liquids, gnats; snow, long on the ground, snow-fleas or grubs; and fire, a peculiar insect which may be the "Fire brat" of our day (*Thermobia domestica* Pack).

Much pains were necessary to uproot and destroy these very generally held ideas, the origin of which can be readily understood from our knowledge of relation of insect to living plants and to dead or decaying animal and vegetable matter. These views were held as late as the beginning of the 18th century, as,

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*See Osten Sacken: On the Bugonia Lore of the ancients.

for instance, by Kircher and Bonanni, notwithstanding that the latter did very much for natural history; and in fact the idea of spontaneous generation of life was not definitely disposed of until the time of Pasteur and Tyndall, within the recollection of many of us.

The Ray period, or the interval included between the times of Ray and Réaumur, or what is practically the latter half of the 17th century, which was the prolific period, and the first half of the 18th century, marks a very decided advance in the progress of the science of entomology. Very much of excellent work was done during this period, which, while reaching to the time of Linné, was not, or scarcely, influenced by the great Swedish naturalist.

A chronological list of the principal writers of this period is introduced:

Principal Writers of the Ray Period.

Goedart, Johann, 1620–1668.
Redi, Francesco, 1626–1697.
Malpighi, Marcello, 1628–1694.
Ray, John, 1628–1704–7?
Leeuwenhoeck, Antony van, 1632–1723.
Swammerdam, Johann, 1637–1685.
Lister, Martin, 1638–1711.
Bonanni, Filippo, 1638–1725.
Merian, Maria Sibylla, 1647–1717.
Vallisnieri, Antonio, 1661–1730.
Frisch, Johann Leonhard, 1666–1743.
Catesby, Mark, 1679–1749.
Réaumur, Réné Antoine Ferchault de, 1683–1757.
Albin, Eleazar, writings, 1720–1736.

The habits and metamorphoses of insects were carefully studied and delineated by Goedart, one of the earliest writers (1620–1668), and Réaumur, one of the later (1683–1757).

Johann Goedart was a painter of Middleburg, and his work, "*Metamorphoses et Historia Naturalis Insectorum*," etc., three volumes with many plates, some colored, published between 1662–1669, is a very creditable production for the time, and, while containing many fanciful stories about ants, bees, mole crickets, etc., yet contains many valuable observations, notably on the life-habits of the Lepidoptera, and was a decided influence in the advancement of the science. It was translated into Dutch, English, and French.

Of Réaumur (Réné Antoine Ferchault de), member of the

Academy of Sciences, Paris, too much praise can hardly be said. He is the author who has perhaps most studied the habits and metamorphoses of insects, and the results of his work are as useful and serviceable to-day as when written, and in correctness of delineation and in accuracy of observation they have not been excelled. His work, "*Mémoirs pour servir à l'histoire des Insectes*," Paris, 1734–1742, seven volumes, the last in manuscript, is one of the most important contributions which has ever been made to the science of entomology. One cannot but feel impressed, in reading his introductory chapter, with the soundness of his views; and an examination of his records of the habits of insects and of his magnificent plates, in which all stages are portrayed, indicate his enthusiasm and painstaking care.

In anatomy this period presents the important names of Marcello Malpighi (1628–1694) and Johann Swammerdam (1637–1685), both physicians, the one of Bologna and the other of Amsterdam. Antony van Leeuwenhoeck (1632–1723), a naturalist and physician of Delft, may also be classed here, more especially for his microscopical researches, which are remarkable when it is remembered that his instrument was unable to give much more than 100 diameters. His principal work, containing much about insects, is his "*Arcana naturæ detecta ope microscopiorum*," 1695–1714, four volumes, which was translated into English and German and went through many editions.

The first published treatise on the internal anatomy of insects was the work of Malpighi, who has left an account of the anatomy of the silk-worm (*Dissertatio epistolica de Bombyce*, etc., London, 1664, 12 plates) in which he describes the dorsal vessel, correctly calling it the heart, and also the respiratory organs, the intestinal canal, and other organs, internal and external.

Swammerdam is practically the founder of our knowledge of the general anatomy of insects, and is one of the principal writers on this subject. His first important work, "*Historia Insectorum generalis*," with 13 plates, appeared in 1669. His chief work on insects, "*Biblia naturæ*," or "*Bibel der Natur*," was not published, however, until long after his death, by Boerhave (1737–8), and contains the exposition of his very

advanced system of classification. Insects and other small allied animals are separated into the major groups on the basis of metamorphosis, now for the first time suggested as means of classification. The subclasses are based, for the most part, on characters taken from the perfect insects.

Four general classes are designated, as follows:

Class I. Insects which emerge from the egg in, or nearly, their ultimate forms, as spiders, snails, earthworms, leeches, lice, etc., with two subclasses based on the habit of being oviparous or viviparous respectively.

Class II. Insects which emerge from the egg with six feet and are active throughout life, ultimately becoming winged, as locusts, dragon-flies, ephemerids, earwigs, true bugs, etc., or practically insects having incomplete metamorphosis. The ordinal groups in this section are not distinguished.

Class III. Insects with incomplete metamorphosis, or having distinctive egg, larval, pupal, and imago states, with two subclasses, the one with free limbs in the pupal state, as Coleoptera, most Hymenoptera, and some flies, and the other, in which the limbs are not free, for the Lepidoptera.

Class IV. Insects which do not shed the larval skin on completing larval growth, but resume a condition, similar to an egg, in which the skin of the mature larva serves as a sort of cocoon, as most Diptera (flesh-flies, etc.).

In the case of this last section, Swammerdam recognized that a true chrysalis is found ultimately with the old larval envelope corresponding with that of class III, but nevertheless he considered the character described a good one, and with less reason, on the authority of Réaumur, who strongly criticised him, he made his class IV include generally all worms living in caterpillars (parasites) and in fruits, galls, and rotting wood.

As an influence on zoological science in general, John Ray is perhaps the most important name of the period, though owing very much in the department of insects to Swammerdam. Ray was born in 1628 and died somewhere between 1704 and 1707. He was an English theologian, and was one of the first of the new school of naturalists to methodize his knowledge of the animal kingdom, being with Swammerdam the forerunner and principal guide of Linné in this department of natural science. His chief writings are "*Wisdom of God Manifested in the Works of Creation*," London, 1691, and "*Historia Insectorum*," 1700. In the preparation of the last he was much as-

sisted by Francis Willoughby (1635–1672). This work was somewhat revised and republished in full with appendix by Lister in 1710. His "*Methodus Insectorum*" appeared in London in 1705.

Ray's classification in the "Historia Insectorum" was based, as already indicated, on Swammerdam's, which he followed very closely, adopting the four general classes of the latter, and differing only in some of the subdivisions which he carried out in considerable detail. The important divergence is in class III, which Ray subdivided into two sections, one for Coleoptera and the other the *anelytra*, which latter is subdivided into the scaly wings or Lepidoptera and the membranaceous winged insects or some Diptera and most Hymenoptera.

The only other classifier of the period is Antonio Vallisnieri (1661–1730), a celebrated professor of Padua, a physician and naturalist, and the author of many short papers, and especially of a new idea for the general classification of insects, based on habits.* He divides them into four principal classes, with a vast number of subdivisions under each class. His principal divisions are as follows: 1, insects inhabiting plants and nourished by plants; 2, water or fluid insects; 3, insects inhabiting soil, sand, mud, stones, and bones of dead animals; 4, insects subsisting in or on other living animals. As an example of his subdivisions, his class I has 42 subsections, each of which is again more or less numerously subdivided.

Réaumur's own classification, if it may be called such, was based altogether on habits and dealt prominently with whatever stages, whether larval or adult, chanced to be the most apt to come under observation. In other words, he associated insects together and described them as he found them in nature, and as his purpose was not to enumerate species and genera, but to give the habits of common species and to facilitate the identification of whatever form happened to be most noticeable, the classification which he adopted was well suited for his purpose.

Of the general writers of this period, two are especially worthy of mention; one of these, Filipo Bonanni, a Jesuit pro-

* *Esperienze ed osservazioni intorne all' origine sviluppi e costumi di varii insetti.* 1713. Padua.

fessor of the College of Rome (1638-1725), is noted for his connection with Kircher, already alluded to, and for his championing of the theory of the origin of many insects from decaying animal and vegetable matter. His work entitled "*Observationes circa viventia, quæ in rebus non viventibus reperiuntur*," etc., Rome, 1691, is indicative of this tendency. These views were combatted by Malpighi and Leeuwenhoeck, and especially by Francesco Redi (1626–1697), a celebrated writer and physician of Arezzo, and a "declared enemy of superstition," chiefly in his work, which appeared in many editions, entitled "*Esperienze intorno alla generazione degl' Insetti*," Florence, 1668 (228 pp. and 29 copperplates of remarkable beauty).* By means of careful experiments he exploded completely the idea of spontaneous generation of insects, except in the case of gall insects, which he supposed must come from a certain "soul in plants which evolves these worms."

Martin Lister (1638–1711), a London physician, is chiefly remembered in entomology for his translating or republishing the works of Goedart and Ray. He is also the author of a number of miscellaneous papers on popular subjects, such as the "Acid of Ants" and "Cochineal Insects," and of a valuable work on spiders (London, 1678).

A very important branch of the entomological work of this period was in the delineation and characterization of insects as exemplified by the painstaking work of Madam Merian, and Messrs. Frisch, Catesby, and Albin. At this time illustration by copperplate engraving was in a vigorous and flourishing condition and several expert engravers were very much interested in insects and with incredible pains and industry produced hundreds of very beautiful plates, most of them afterward hand-colored from life. These very expensive works apparently met a prompt demand and often went through several editions and were frequently translated and republished in other languages.

The most noted person of the period in this connection is Madam Maria Sybilla Merian, a miniature painter, born in 1607 and dying in Amsterdam in 1717. She married a copper-

*I have seen only the Latin translation published in Amsterdam, 1671.

engraver, J. A. Graff, from whom she early separated. In her work of illustrating insects she was assisted by her two daughters, who continued the work after the death of their mother, and the younger published Madam Merian's final great work some time after her mother's death. Three very important works were produced, one on larval transformations, with 100 colored plates,* and a second on the insects of Surinam, with 60 colored plates,† which was the result of a trip made to Surinam, S. A., for the special purpose of studying the insect fauna of that region. Her last great work, entitled "History of the Insects of Europe," 184 plates,‡ was published posthumously by her second daughter, who inherited much of her mother's talent. These works are little more than a series of plates or illustrations with explanations, but are finely engraved and colored from nature. The life-long industry of this woman, when considered in connection with the vast amount of work which she accomplished, and her zeal which led her to cross the Atlantic and study the insects of what is now Dutch Guiana, indicate an enthusiasm which is rarely seen in any age, and have given her a unique and honorable place in the history of entomology.

Johann Leonhard Frisch (1666–1743), rector of the Gymnasium of Berlin, published a valuable work, in 13 parts, entitled "*Beschreibung von Allerley Insecten in Tütschland*, etc.," 1720–1738, illustrated with many copperplates. It contains much important matter relating to common and injurious species.

Mark Catesby (1679–1749) was a noted naturalist traveler who journeyed in North America, and in his natural history of Carolina, Florida, and the Bahama Islands, 2 volumes, folio, London, 1734–1743, illustrated with 220 colored plates, figured to some little extent the insects of the region mentioned.

Eleazar Albin, an English painter, residing in London, published a "Natural History of English Insects" (London, 1720), "illustrated with a hundred copper plates, curiously engraven from the life, and (for those who desire it) exactly coloured by

* *Der Raupen wunderbare Verwandlung, und sonderbare Blumennahrung*, etc., 2 vols., Nurnberg, 1674–1683.

† *Metamorphosis insectorum Surinamensium*, etc., Amsterdam, 1705.

‡ *De Europische Insecten*, etc., Amsterdam, 1730.

the author." This work went through several editions. He published also a "Natural History of Spiders and other curious Insects" (1736), with 53 copper plates.

His work on insects is little more than a series of very excellent plates illustrating food-plants, early stages, and adults, with frequent parasites, and with single page descriptions of the plates, each of which is dedicated to some royal or noble person, subscriber to the work. Brief descriptions are given of the different stages and the habits of the insects, and references are given also to the older authors who have treated the same insects.

These with Réaumur were the great illustrators of the period, and their output represents a very considerable amount of the work accomplished in entomology.

In looking over this period one is impressed with the fact that in the study of life-histories of insects, as typified by the work of Réaumur, Goedart, and Frisch, the results are as good as any since accomplished. In the study of the metamophoses, anatomy, and physiology of insects, which was almost pioneer work, and in the portrayal of insects and their transformations the period is also notable for its excellent output. In the beginning of a philosophical classification of insects, Swammerdam and Ray's work, while very imperfect, cannot be overestimated as furnishing the basis and guide for the later and more satisfactory system of Linné. One witnesses also the beginning of wholesome original work and the final abandonment of the ancient superstitions relative to the origin of most insects. The work in general, therefore, of this pre-Linnean period is, much of it, of a most excellent character, and indicates that the science of entomology had intelligent and learned votaries and had reached a very advanced position long before the work of the great Swedish naturalist gave it a definite basis in nomenclature.

Group IV.—Linné and Contemporaries.

We now come to Linné and his contemporaries, representing in entomology a small group of workers, but containing a number of names which are still well known. This period includes the generation born between 1700 and 1740, and its principal representatives, arranged chronologically, are as follows:

Principal Contemporaries of Linné.

Clerck (Carl Alexander). Died in 1765. Was a Swedish painter and a pupil of Linné. He was the author of several important papers on insects, and an illustrated work on spiders, using the binomial system of nomenclature (1757) one year earlier than Linné's 10th edition.

Bartram (John). 1701–1778. "The Quaker naturalist of Philadelphia;" was chiefly a botanist, but wrote short articles on wasps, dragon-flies, the cicada, etc., in Philos. Trans. Phila. 1745–1763.

Roesel von Rosenhof (August Johann). 1705–1759. A miniature painter of Nuremburg, and a very ingenious observer and delineator of natural-history subjects, chiefly insects. Was author of "*Der monatlich herausgegebenen Insecten-Belustigung*" ("Recreations with Insects, published monthly"), 4 vols., 1746–1761, 356 colored plates.

Wilkes (Benjamin). Works 1741–1773. Author of 120 colored copperplates of English moths and butterflies, representing their changes into caterpillars, chrysalid and fly states, and plants, flowers, and fruits whereon they feed, with natural history and index of insects and plants adapted to the Linnean system. Two editions, London.

Linné (Charles von). 1707–1778. Professor of Natural History at Upsala. Principal works: "*Systema Naturæ,*" 1735 (10th edition, adopting binomial system, 1758); "*Fauna Suecica,*" 1746.

Lyonet (Pierre). 1706 or 7–1789. Interpreting Secretary to the United Provinces (Holland). "*Traité anatomique de la Chenille qui Ronge le bois de saule, etc.,*" 1760, La Hague. Same work somewhat extended, 616 pp., 18 plates, 1762.

Sepp (Christian). A copperplate engraver of Amsterdam (Holland). Real name probably Smith or Schmidt. Published *Nederlandische Insecten*, etc., 1762 on; continued by his son John Christian Sepp (1739–1811). The plates illustrating the work by the elder Sepp have never been excelled in engraving and coloring.

Abbott (John). Work published in part by Smith (1759–1828) in 1797.

Kalm (Pehr). 1713–1797. A pupil of Linné; was sent to America by the Swedish government and traveled extensively in the colonies. "Travels in N. A." (1753–'61), Stockholm, and other papers in which are many references to the common insects of this country.

Schaeffer (Jacob Christian). 1718–1790 A doctor of theology and clergyman of Regensburg. Principal works: "*Elementia Entomologica,*" 1766, 135 colored plates; and "*Icones Insectorum circa Ratisbonam indigenorum,*" 1778, 149 colored plates.

DeGeer (Carl). 1720–1778. A baron and marshal of the court of the Queen of Sweden and member of the Academy of Stockholm. Gave much of his fortune to furthering science Wrote "*Mémoirs pour servir à l'histoire des Insectes,*" 7 vols., 338 plates.

Bonnet (Charles). 1720–1793. A celebrated philosopher and naturalist of Geneva and author of "*Traité d'Insectologie ou observations sur les Pucerons*," 2 vols., Paris, 1745, and many other works.

Scopoli (Jean Antoine). 1723–1788. Physician in Idria; later professor of chemistry and botany in Pavia. Chief work: "*Entomologia Carniolica*," etc., 1763. Ill.)

Geoffroy (Etienne Louis). 1727–1810. Physician, Paris. Author of "*Histoire abregée des insectes*," etc. 1st edit. 1762; last 1799.

The noteworthy events of this period are the establishment of a binomial system of nomenclature by Linné in lieu of the old cumbersome descriptive clauses and the fixed definitions of genera and species by Linné, Schaeffer, DeGeer, Bonnet, Scopoli, and Clerck.

In this and the later periods, time will not allow me to go much into detail. Linné's system of clasification, however, I will briefly describe on account of the interest which attaches to it in relation to and as an outgrowth of the older systems. His earliest classification of insects in the first edition of his *Systema Naturæ* (1735) is much inferior to the older systems of Swammerdam and Ray, as the following statement of his four classes, illustrates:

Class	I.	Four wings, of which the two upper are crustaceous (Coleoptera and Orthoptera)	*Coleoptera.*
Class	II.	Two or four wings, (Lepidoptera, Neuroptera, Hymenoptera and Diptera)	*Angioptera.*
Class	III.	Four wings of which the two superior are half membranous	*Hemiptera.*
Class	IV.	Without wings	*Aptera.*

The successive editions of this work vastly modified and improved this table, and the form it assumed in the 12th edition (1767), which follows, has since been accepted for most of the orders substantially as he left it.

Wings.	4.	Superior	Crustaceous, with straight suture	*Coleoptera,*	1
			Semicrustaceous, incumbent	*Hemiptera,*	2
		All	Imbricated with scales	*Lepidoptera,*	3
			Membranous.—Anus Unarmed	*Neuroptera,*	4
			Aculeate	*Hymenoptera,*	5
	2.	Halteres in place of posteriors		*Diptera,*	6
	0.	Without either wings or elytra		*Aptera,*	7

In all the editions of his work from the 1st to the 11th, Linné united the Orthoptera with the Coleoptera, but in the 12th edition the Orthoptera are placed with the Hemiptera, with which they have much less relationship. His *Aptera* contains not only the insects now usually so classed, but also certain lice, the fleas, spiders, mites, myriapods, etc.

The other important systems of classification of this period are those of DeGeer and Geoffroy, both much inferior to that of Linné. The former, DeGeer, first employed the mouth-parts as a means of classification, and separated the Orthoptera definitely under the name of Hemiptera—the true bugs being variously divided, but for the most part placed in the order *Siphonata*. He made in all 14 classes. Geoffroy gives 6 classes or orders and in the classification of the Coleoptera first makes use, as a means of separation, of the number of tarsal joints.

In the anatomy of insects the work of Pierre Lyonet, an engraver of extraordinary ability and anatomist of the first rank, has not been approached in later years either in accuracy and minuteness of dissection or beauty of illustration, and is still the standard source of information relative to the larvæ of Lepidoptera.

The very elaborate works illustrating insects and life-histories of the former period were continued in the present by Roesel von Rosenhof, Wilkes, Abbott, Sepp, Schaeffer, DeGeer, Geoffroy, and Bonnet. The latter, who was in a sense a pupil of Réaumur's, is to be remembered for having discovered the continued fertility of plant-lice in the absence of males, through many successive generations.

Relating more particularly to the insects of America were certain papers by John Bartram, published in the Philadelphia Transactions, and the works of Pehr Kalm, whose travels in North America, published in Stockholm, 1753–1761, contain much interesting information relative to the common insects of this country at that early period, and, most important of all, the illustrations of Lepidoptera of Georgia by Abbott, published in part by Smith in 1797.

The enthusiasm for the illustration of insects, represented by this period and the last, has never been surpassed in later years,

and is interesting not only from the excellence of much of the work, but from the fact, already alluded to, that these works seemed to be much in demand, often going through many editions.

Group V.—Pupils and Immediate Followers of Linné.

The period following that of the contemporaries of Linné and scarcely separable from it may be made to include Linné's pupils and immediate followers, and covers the very prolific 50 years, especially for descriptive and systematic entomology, between 1775 and 1825.

The well-known names of this period are so numerous that it is impossible to refer to them in detail, and the increase of the number of persons who really accomplished notable results in connection with the many societies and journals devoted to entomology which started about this time is an illustration of the inspiration which Linné produced. It must be remembered also that at this early period work in entomology, so far as it related to the characterization and naming of insects, was a comparatively new field, and that the collector in any new region had practically no need to trouble himself about whether or no a species had been earlier described. Much of the enthusiasm, therefore, is undoubtedly due to the fact that the material was ample and easy of access, and the difficulties which have resulted in later years from the separation of species into thousands of small genera and the more close and careful scrutiny of species themselves had not then arisen to make systematic work difficult. Some of the important names of the period follow:

Pupils and Immediate Followers of Linné.

(Writings: 1775–1825; born 1740–1790.)

Esper (Eugen Johann Christoph). 1742–1810. Professor in Erlangen. (Work on butterflies of Europe and foreign countries, illustrated with colored copperplates.)

Herbst (Johann Friedrich Wilhelm). 1743–1807. Military Chaplain in Berlin. (Work, popular and general; also systematic and classificatory).

Thunberg (Carl Peter.) 1743–1828. Followed Linné as Professor of Natural History at Upsala. (Work, chiefly descriptive.)

Fabricius (Johann Christian). 1745–1808. Professor of Natural History and Rural Economy at Kiel. (Descriptive and systematic.)

Schrank (Franz von Paula). 1747–1835. Professor in Ingolstadt, Bavaria. (Work, general.)

Cramer (Pieter). Works 1778–1782. A merchant of Amsterdam. (400 colored plates of exotic butterflies.)

Huber (François). 1750–1831. (Work on bees in which his son Jean Pierre assisted.)

Panzer (George Wolfgang Franz). 1755–1829. A physician of Nürnberg. (Work: "*Deutschlands Insecten*," 1793–1813, colored illustrations of each species.)

Olivier (Antoine Guillaume). 1756–1814. Professor of Zoology at Alfort. ("*Hist. Nat. des Insectes*," etc.; many colored plates.)

Peck (William Dandridge). 1756–1820. Professor of Botany in Harvard College. (General economic.)

Smith (James Edward). 1759–1828. (Natural History of the Insects of Georgia, etc.—Abbott—104 colored plates.)

Kirby (William). 1759–1850. An English clergyman. ("An Introduction to Entomology," etc., with Spence.)

Hübner (Jacob). 1761–1826. A painter of Augsburg. (Lepid.-Europ. and Exotic.)

Meigen (Johann Wilhelm). 1763–1845. A German naturalist. (Diptera of Europe.)

Fallén (Carl Friedrich). 1764–1830. Professor of Natural History in Lund. (Diptera.)

Latreille (Pierre André). 1767–1833. (*Hist. Nat. général et particulière des crustacés et des Insectes*, 14 vols., 112 pls., Paris, 1802–1805. "*Genera Crustaceorum et Insectorum*," 4 vols., ill., Paris, 1806, in which families as subdivisions of orders were first used.)

Cuvier (George Léopold Chrétien Dagobert.) 1769–1832. ("*Le Regne animal*," etc.)

von *Humboldt* (Friedrich Heinrich Alexander). 1769–1859. German physician, traveller, and naturalist.

Wiedemann (Christian Rudolph Wilhelm). 1770–1840. Professor in Kiel. (Descriptive and monographic—chiefly Diptera.)

Lepelletier (Amédée Louis Michel, Compte de Sainte Fargeau.) 1770–1845. (General and Hymenoptera.)

Clark (Bracy). 1770–1860. An English veterinary surgeon. (Œstridæ.)

Sturm (Jacob). 1771–1848. A physician in Nürnberg. (Hundreds of colored copperplates of the insects of Germany.)

Illiger (Johann Carl Wilhelm). 1775–1815. Professor in Berlin. (Catalogues, etc., founder of "*Mag. für Insectenkunde*.")

Klug (Johann Christoph Friedrich). 1775–1856. A physician in Berlin. (Chiefly Hymenoptera.)

Spence (William.) 1775(?)–1860. ("An Introduction to Entomology," etc. With Kirby.)

Treitschke (Friedrich). 1776–1842. Manager of the Royal Theatre, Vienna. (Continued Ochsenheimer's "*Die Schmetterlinge von Europa*.")

Gravenhorst (Johann Ludwig Carl). 1777–1857. Professor of Natural Sciences in University of Breslau. (Parasitic hymenoptera.)

De Jean (Compte Pierre François Marie Auguste). 1780–1845. Lieut.-Général, etc. (Collector and coleopterist.)

Spinola (Marchese Maximiliano). 1780–1875. A Genoese nobleman. (Descr. papers in French and Italian.)

Dufour (Léon). 1782–1865. French physician. (Anatomical and descriptive.)

Bouché (Peter Friedrich). 1784–1856. Head gardener in Berlin. (Chiefly economic.)

Zetterstedt (Johann Wilhelm). 1785–1874. Professor in Lund. (General descr., for the most part Dipt.)

Germar (Ernst Friedrich). 1786–1853. Professor of mineralogy in Halle. (General; Germar's Mag.)

Say (Thomas). 1787–1834. (General descriptive.)

This list of names scarcely needs further amplification to the members of this Society, even if my time admitted it, to indicate the characteristics or value of the work accomplished. Prominent in descriptive and systematic writings in general entomology are Herbst, Thunberg, Fabricius, Schrank, Latreille, De Jean, Spinola, and Say. In Lepidoptera, the names of Esper, Hübner, and Treitschke will be remembered; in Diptera, Meigen, Fallén, Wiedemann, and Zetterstedt; in Hymenoptera, Lepelletier, Gravenhorst, and Klug; in illustrations and natural history, many of the above and also Kramer, Hübner, Olivier, Smith and Abbott, Humboldt, and Sturm; in economics, Peck, Clark, and Bouché; in anatomy, Dufour and Cuvier; in general entomology, Kirby and Spence and Panzer; and as founders of entomological magazines, Illiger and Germar.

Since I have referred especially to systems of classifications in the foregoing pages, it seems necessary to devote a paragraph to this subject in connection with this period also. The most eminent names in this regard are Fabricius and Latreille. The classification of Fabricius as he finally left it, containing 13 orders, all of which were newly named, was based solely on the character of the mouth-parts, which resulted in a general disassociation of allied groups. His characterizations of genera and

species, however, hold for the most part to-day. Various attempts were made by Illiger, Oliver, and others to combine the systems of Linné and Fabricius, with results which were far from satisfactory, and no real advance was made until Latreille and the other systematic workers of his time, as Lamarck, Cuvier, Kirby, and Spence, etc., gave their efforts to this subject. To Latreille, chiefly, however, the credit is due for the final proper limiting of the Class Insecta, and the separation of the groups represented by the Myriapoda, Arachnida, Crustacea, etc., which had hitherto been generally associated with insects, and especially for the establishment of a natural system of classification of insects based on a combination of the characters—metamorphosis, wings, and mouth-parts—formerly employed respectively by Swammerdam and Ray, Linné and DeGeer. Latreille should be especially mentioned also as the father of the family names as subdivisions of orders—which were later given, as has been recently pointed out by Dr. Gill, uniform (patronymic) terminations on the recommendation of Kirby.

This period overlaps and is really a continuation of the Linnean period. Thunberg, Fabricius, and others of this period were students of Linné, at Upsala, and the former afterwards followed Linné as professor of natural history. It will be noted that most of the distinguished entomologists of this period were either professors in universities or were physicians. Several of the important illustrators, as in the former period, were either painters or engravers. Treitschke was manager of the Royal Theatre at Vienna; Clark was an English veterinary surgeon; Bouché was a master gardener in Berlin; Kirby was an English clergyman; and Spinola was a Genoese nobleman.

Group VI.—The 19th-Century Writers.

We now come to a generation which connects closely with the last and touches the one in which we live. It includes the authors born between 1790 and 1815. In this period the activities which were so marked in the last were continued with scarcely diminished zeal and prolificness. These two periods together are the great working eras in the history of the science

of entomology, and in glancing through Hagen's Bibliotheca it is seen that a large proportion of the important names in the science fall within these limits. The list of the chief writers of this period is herewith presented, arranged chronologically:

Important 19th-Century Writers.

(Born between 1790 and 1815.*)

Straus-Duerkheim 1790-1865.
Stephens. 1792-1852.
Eschscholtz. 1793-1831.
Passerini. 1793-1857.
Macquart. (1794)-1855.
MacLeay. (1794)-1865.
Harris. 1795-1856.
Kollar. 1797-1860.
Mulsant. 1797-1880.
Audouin. 1797-1841.
Mannerheim. (1798)-1854.
Curtis. (1798)-1862.
Desvoidy. 1799-1857.
Guérin-Méneville. 1799-1874.
Herrich-Schaeffer. 1799-1874.
Boisduval. 1799-1879.
Géné. 1800-1847.
Lacordaire. 1801-1870.
Ratzeburg. 1801-1871.
Newman. 1801-1876.
Aubé. 1802-1869.
Newport. 1803-1854.
Morris. 1803-1879.
Kirchner. (1803)-1879.
Laporte. (1803)-
von Siebold. 1804-1884.
Smith, F. 1805-1879.
Hartig. 1805-1880.
Westwood. 1805-1893.
Lucas. (1805)-
Dahlbom. 1806-1859.
Hope. (1806)-1862.
Chevrolat. (1806)-1885.
Duncan. (1807)-
Agassiz. 1807-1873.
Loew. 1807-1879.
Burmeister. 1807-1892.
Walsh. 1808-1869.
Wesmael. (1808)-1879.
Perris. 1808-1878.
Guenée. 1808-1880.
Zeller. 1808-1883.
Schuckard. (1809)-
Motschulsky. (1809)-1871.
Walker. 1809-1874.
Brullé. 1809-
Fitch. 1809-1879.
Darwin. 1809-1882.
Doubleday. 1810-1849.
Waterhouse. 1810-1888.
Schioedte. (1811)-1884.
Murray. 1812-1878.
Haldeman. 1812-1880.
Glover. 1813-1883.
Costa. (1813)-
LeBaron. 1814-1876.

While this list includes the name of Darwin, who was born in the same year with Fitch and only two or three years later than Westwood, Agassiz and Burmeister, Darwin's epoch-making work, the "Origin of Species," appeared too late in his life (1868-9) to exert much influence on many of the writers listed.

* Where date of birth is unknown it is estimated provisionally about 25 years earlier than first writing and inclosed in brackets.

Time does not offer to particularize the work done by the authors mentioned. In the descriptive and systematic field the workers were numerous. The general subject was covered by La Porte, Walker, and Géné. In Coleoptera were Eschscholtz, Mannerheim, Lacordaire, Mulsant, Chevrolat, Aubé, Waterhouse, Schioedte, Murray, and Motschulsky. In Diptera, Desvoidy, Macquart, and Loew. In Lepidoptera, Schaeffer, Boisduval, Zeller, Morris, Doubleday, and Guenée. In Hymenoptera, Brullé, Hartig, Shuckard, Smith, Kirchner, Dahlbom, and Walsh. In illustrations and natural history, Stevens, Passerini, Harris, Curtis, and Perris. In economics, several of those mentioned and Kollar, Guérin-Méneville, Ratzeburg, and Fitch. In anatomy, Strauss-Duerkheim, Audouin, Newport, and Burmeister. In general writings, Stevens, Guérin-Méneville, Duncan, MacLeay, Newman, Westwood, Burmeister, Hope, Lucas, Walsh, Glover, Haldeman, LeBaron, and Costa. Hagen, the great bibliographer, and specialist in Neuroptera as well as in the general subject, though born somewhat later, belongs with this group of entomologists.

I have not classified with the above a group of entomologists born a little later (1815–1850) but forming practically a continuation of this group, and represented in part by the older living writers of the present day or immediately preceding the generation just beginning to take a prominent place in the science. This group covers the later life of Charles Darwin, and the workers of the period were more influenced by him, and their investigation and studies bear more directly on the difficult and intricate questions connected with biogenesis which his work brought into special prominence.

Of these writers, prominent in the study of Coleoptera are Redtenbacher, Schaum, LeConte, Thompson, Blackburn, Crotch, Lindemann, and Horn. In Diptera, Snellen van Vollenhoven, Rondani, Osten Sacken, Schiner, Brauer, Bergenstamm, Mik, and Van der Wulp. In Lepidoptera, Stainton, Scudder, Edwards, Clemens, Grote, Fernald, and many others. In Hemiptera, Signoret, Stål, Douglas, Marshall, and Uhler. In Hymenoptera, Foerster, Kirby, De Saussure, Zaddach, Cresson, Provancher, Bassett, Brischke, Mayr, and Holmgren. In

general writings, Gerstaecker, Leuckart, Leech, Donovan, Bates, Brauer, Kaltenbach, Taschenberg, Lubbock, Riley, Wallace, Packard, and Lintner. Scudder's work in palæo-entomology and Laboulbène's in anatomy should also be mentioned.

This summary of the workers in entomology from the earliest period to our own generation has been most fragmentary and incomplete, but may be sufficient to indicate the great interest which the subject has always aroused, and furnishes a basis for the estimate which will be given later of the extent and character of the work which has been accomplished.

The Literature of Entomology.

That the accumulated writings on insects of all these centuries of activity make a very considerable mass of literature, hardly needs stating. It may be interesting, therefore, to make as careful an estimate as may be of the actual amount of published matter which has resulted from these several hundred years of investigation and printing of results.

The conditions, in the matter of available literature immediately prior to Linné, are somewhat indicated by Réaumur, who, writing in 1734, complains of the fewness of works in the French language which treat of insects and says that even in other languages the number is not great and the majority of them contain a large amount of observations for the most part made in such a manner as to please only those already interested in such studies, and not calculated to arouse interest in others. He mentions critically the writers of the periods preceding his own, most of whom have already been referred to in the preceding portions of this paper.

In such ancient compiled works, however, as those of Pliny, Ælien, Aldrovandi, Moufet, etc., the number of authors referred to is often very large—in some instances including almost every important writer of antiquity. In the *Theatrum Insectorum* of Gesner, Moufet, et al., over 400 ancient authors are listed, many of whom, of course, referred to insects incidentally only. Pliny refers by name to less than a dozen Roman and foreign writers in the text of his chapter on insects, but he often mentions writers

in a general way without specifying the person or persons. In summarizing the authors quoted at the end of Book XI he mentions some 21 Roman and 25 foreign writers, but as more than one-half of the book deals with other animals, one-half of the references probably concern other subjects. As early even as the time of Réaumur, however, in spite of the latter's complaint of the dearth of literature, there must have been many entomological works if they could have been made accessible. Linné, only a few years after Réaumur, consulted or referred to somewhere between 75 and 100 authors, but mentions about 30 only as important (12th edition), and Geoffroy towards the close of the same century (1799) refers to a little over 50 authors.

Kirby and Spence, in the preparation of their Introduction to Entomology, consulted some 262 authors, referring among others to Lord Bacon, Erasmus Darwin, Oliver Goldsmith, Thomas Tusser, and Isaac Walton, and most of the old writers who have already been mentioned in the preceding pages. They also consulted the transactions of some 14 societies and 19 periodical works, of which 4 only were strictly entomological, and these all in German.

The vast number of entomological papers and works which began to appear about this time is indicated by the complaint of Lacordaire, writing early in the present century. He says: "Their number is such and they succeed each other so rapidly that one of the principal difficulties for those who cultivate the science seriously is to keep track of the innumerable publications which flood us from all quarters."

Hagen's monumental work, "Bibliotheca Entomologica," brings the record of the literature relating to insects from the earliest times down to the year 1862. He lists some 4,766 authors and enumerates 18,130 distinct titles, together with 851 anonymous publications. Vast as this collection is, it is necessarily far from being a complete list of the writings on insects up to that time. It must be remembered, however, that a large percentage of the titles enumerated by Hagen relate to bees and silk-worms, and that many of the papers are very brief and unimportant. On the other hand, many of the works are very extensive, often amounting to many volumes, and it therefore

seems within bounds to estimate the number of volumes at one-half the titles enumerated or 9,000 volumes. This estimate leaves out the anonymous communications, most of which are short, and does not account for a great deal of fugitive writing which escaped Hagen's knowledge.

There is no easy means of estimating the amount of published matter which has appeared since the time of Hagen's Bibliotheca, except in a little later data which he himself has given. That the annual additions of published matter, however, are enormous is shown by a brief examination of the yearly volumes of the Zoological Record, Zoologischer Anzeiger, Taschenberg's Bibliotheca Zoologica, and other similar works. In the last volume of the Zoological Record, that for 1895, 1,251 titles of publications on insects are catalogued, the mere description and indexing of which occupy 387 pages. In the year previous the number of titles was almost as great. A very conservative estimate of the amount of published matter which is thus added yearly to the stock of entomological literature, estimating roughly in 500-page volumes, places the number of such volumes at 75. That 2,000 volumes have been added to the stock of entomological literature during the 35 years since the publication of Hagen's Bibliotheca is, therefore, a conservative estimate.

A form of literature which is not, or to a very slight extent, included in the above estimates is the economic phase of the subject, which, of late years, has assumed very considerable proportions. In Henshaw's "Bibliography of the More Important Contributions to American Economic Entomology," brought down to 1888, are included the names of over 500 writers and 5,424 titles. The publications, of this character, for the most part subsequent to 1888, by the State Agricultural Experiment Stations, established under the Hatch Act, were listed up to July, 1894, by Mr. Howard in the address referred to at the outset of this paper, and amount to about 300 separate bulletins and reports. Since that date, about 200 additional publications have appeared from this source. This large amount of so-called economic writings is much of it repetition and little of it is of such a character as to become a portion of the permanent literature of the science of entomology. The records of such writings in this country are

very complete, but in the similar economic literature of Germany, France, and other European countries the records have not been collected with the same pains, and most of the literature is unknown except in the limited districts in which it finds first circulation, but the combined bulk of it must be almost as great foı these countries as it is in the United States, especially in Germany, where forestry inspectors and entomologists are numerous, and in France, where agricultural and horticultural schools abound.

From the foregoing data I do not think I am likely to exceed the truth in putting the bulk of the writings on insects available to-day at the equivalent of from 12 to 15 thousand volumes. This estimate does not include the recent literature of apiculture, the extent of which in later years may be gathered from the fact that, as listed for me by Mr. Benton, there are now some 63 journals devoted to this special subject, Germany standing at the head with some 30, the United States following with 8, and many other countries represented by from 1 to 3 or 4 each.

The Number of Persons Interested in the Science at Various Periods.

Another field for estimate which has some interest is to determine the number of individuals at various times in the past who were interested in and wrote more or less on the subject of insects. For the earlier centuries we have no means of estimating, with any accuracy, the number of working entomologists at any given time since the records relate only to the more important names. Some idea of their number may be gained by reference to the number of available works at various periods already given (see p. 109–110).

To determine the number of individuals who are interested in entomology at the present time is also a difficult matter, since all available records are unsatisfactory. The volume of the Zoological Record for 1895 contains a list of 625 authors who dealt with insects proper, and 200 additional who wrote on Arachnida and Myriapoda. An examination of the volumes for the few years immediately preceding 1895 reveals three or four

hundred additional names in recent literature, so that from this source alone we have a record of probably 1,000 persons now living and writing on the subject of insects.

The minutely divided subject-indexes, with consequent frequent duplication of names of Taschenberg's Bibliotheca Zoologica, and similarly of the Zoologischer Anzeiger, Zoologischer Jahresbericht or Bertkau's Entomologischer Bericht, make these sources of information useless for the purpose of estimating the number of living writers. Many of the writers on economic subjects fail to be listed in any of these registers. The number of such writers for America alone is indicated by Henshaw's lists, already referred to, which enumerate 560 authors, most of whom are still living.

It seems to me, therefore, reasonable to say that there are from twelve to fifteen hundred people now living whose writings on insects are of such a character as to be noticed in such standard annual works of record as the Zoologischer Anzeiger, Zoological Record, etc., with probably an equal number who fail of record or write more or less on purely local and economic subjects. This does not include the writers on bees to any extent.

These figures leave out of account the very large number of collectors of insects who rarely, if ever, write on the subject. Perhaps the best available source of estimating this class of workers in entomology is Friedländer's "Zoologisches Adressbuch or International Zoological Directory," Berlin, 1895. From an estimate based on the index of this work, which includes both writers and collectors, it appears that some 4,800 persons are writing on various topics connected with the general subject of insects or are interested in collections. There are necessarily many duplications in this index, and, on the other hand, a great many omissions, but from this and the other sources of information named it is safe to assume that between three and four thousand persons living at the present time are sufficiently interested in entomology to get into the records, either as writers or collectors.

However incomplete the foregoing estimates may be, both as to amount of published matter and the number of persons now interested in the science of entomology, and more or less actively

engaged in working up material or studying habits or investigating questions in biology, etc., enough has been said to show somewhat the vast amount of interest which has been taken in the subject and the vast amount of work done.

What has been, and what Remains to be, Accomplished.

What has been accomplished by all of this industry in the actual knowledge of the characters, habits, life-histories, etc., of insects has not been estimated, nor is it my purpose to attempt an analysis of the work of all these years, nor to discuss special fields of investigation. I wish, however, to draw attention to the phase of this subject covered by the description of species and genera, which, since the time of Linné, has commonly been the preliminary step.

This brings me to the consideration of the probable number of true species of living insects, both as to those which have been described in the literature referred to and those which remain yet undiscovered or undescribed. It would be interesting, if time allowed, to estimate the number of insects which have been studied biologically, or the amount of work which has been done, as a means of understanding the anatomy of insects, and similarly for all the other fields of work in entomology, but I shall have to limit myself to the single consideration mentioned.

Estimates of the Number of Species, Described and Undescribed.

That insects are very abundant is so self-evident that it probably never occurred to the early writers that it would be possible to estimate the actual number of distinct forms, or, at any rate, we have no such estimate until we come down to the time of John Ray. In his work, published in London about 1690, entitled "The Wisdom of God Manifested in the Works of Creation," Ray makes various estimates of the probable number of plants and animals, and estimates the number of species of insects for the whole world at 20,000. In this connection it may be of interest to note that he places the number of beasts, including serpents, at 150, and adds that, according to his belief,

not many that are of any considerable bigness in the known regions of the world have escaped the cognizance of the curious. The number of birds he estimated at 500. The smallness of all these estimates and the confidence which the author expressed in their completeness are interesting at this day and in the light of present knowledge.

In the 12th edition of Linné's Systema Naturæ (1767), on the authority of Dr. Sharp something less than 3,000 species of insects are listed, but no general estimate of the total number of species seems to have been made by Linné.

We have records of various estimates made early in the present century. MacLeay estimated, about 1820, that the collections of Europe contained some 100,000 species of insects, which was accepted as correct by Latreille. Burmeister, however, estimates the number at 80,000. Taking this last figure as a basis, Lacordaire (1838) estimates the proportion of the known species to the unknown by orders and arrives at the conclusion that the total number of species of insects is 362,000. This result he also proves (?) by an estimate based on the number of plants of the world. Taking De Candolle's estimate of plants for the entire globe at 110,000 or 120,000 species and supposing that there would be on an average three insects to each plant, he finds the total of insects to be between 330,000 and 360,000. A little earlier Kirby and Spence, by a similar deduction, found the total number of insects to be 400,000, which figure Lacordaire considered to be too great. The only old estimate commonly quoted is that given by Dr. John Day, in a letter to Mr. Spence in 1853, in which the total number of insects is placed at 250,000 species, a very considerable advance on the number fixed by Ray, but much lower than the figures of an earlier period already quoted.

A number of estimates have since been made by various writers, including Lord Walsingham, Dr. David Sharp, Professor Riley, and others. In 1883 Dr. Sharp said: "As a result of a moderate estimate it appears probable that the number of species of true insects existing at present on our globe is somewhere between 500,000 and one million." Dr. Sharp and Lord Walsingham, in 1889, extended the number of species of insects to a prob-

able two millions. Professor Riley in 1892 made a careful estimate of the number of existing species of insects on the globe, basing it on a careful computation of the number of species already described and the percentage of new species which are always turning up in collections in new or little worked territories. He placed the number of actual species at ten millions, and considered this to be a moderate figure.

A very interesting statement compiled by Mr. Kenyon has recently appeared in the American Naturalist, giving in tabular form the number of described species of living animals in the different classes, as known in the years 1830, 1881, and 1896. This puts the number of described insects, *excluding* Arachnida and Myriapoda, at 49,000 in 1830, 220,000 in 1881, and 230,000 in 1896. Mr. Ashmead, in a former presidential address before this Society, estimated the number of described species of insects at 250,000. The records from which the 230,000 estimate just given was made are necessarily incomplete and it is probable that Mr. Ashmead's figure is the more nearly correct. In the statement just referred to in the American Naturalist the total number of described animals in all classes was only 366,000, and, as will be noted, insects with spiders and Myriapods represent nearly 250,000 of these, leaving only a little over 100,000 for all other animals.

From these figures and Prof. Riley's estimate of the number of insects, it is apparent, as Mr. Kenyon suggests, that a reasonable census of the whole animal kingdom would be about 15,000,000 living species, of which 10,000,000 would be of insects.

It is interesting to note in this connection that Dr. Sharp has recently computed that in the matter of bulk insects probably outrank all other animals together, their small size being more than counterbalanced by the vast number of species and enormous number of individuals.

If we take the estimate of the number of insects in the world at 10,000,000 as a reasonable one, and that at the present time 250,000 of these have been described and are preserved in collections and are known to entomologists, it will be seen that only 1 insect in 40 of the existing species is known, and this fact would seem to throw grave doubt on much of our classifications and

characterizations of genera, particularly in the groups of the smaller species, and especially when we remember that the discoveries of every year cause constant revision of previous studies in both of these particulars.

The vastness of the field of entomology is indicated by the foregoing figures, and that the field is practically inexhaustible from the present standpoint seems to be also fully demonstrated.

Present Rate of Description, and Probable Time of Completion of the Work.

It is an interesting problem to determine how many years more it will take to describe the insects of the world at the present rate of progress. The activity in collecting and describing insects has never been greater than at the present time, and the number of workers is being increased yearly; but as the more accessible regions of the world are worked over, the securing of new species will become more and more difficult and it is reasonable to suppose that even with the constant increase in the number of students of insects the rate of description of new species will probably never very much exceed the present.

Taking the Zoological Record as a basis for computation (and the records therein given are not at all complete), it appears that during the last few years there has been an average of 1,000 new genera and subgenera of insects described yearly, not including the Arachnids and Myriapods, which would add 200 additional genera. This makes a total of 1,200 new genera yearly out of a total for all animals (that is, including insects) of some 1,700 genera. The number of new genera added yearly is somewhat astonishing when it is remembered that Linné had altogether but 74 genera of insects. Some ten years since, Dr. Sharp estimated that during the last 120 years, or since the time of Linné, an average of about 2,000 new species of insects had been annually described. Taking the results of the more recent years as a basis, Lord Walsingham has estimated the number of species now described yearly at 5,000. This is after deducting 8 per cent. for possible synonyms and is considerably below the annual increase indicated for the last 36 years in our recent quotations from

the American Naturalist. If the present rate, therefore, of description of species be kept up it will require upwards of 2,000 years to finish the work of collection and classification of insects. That the entomologists of the world have ample material with which to work and that there is no alarming prospect in the immediate future of exhaustion of the field is strikingly apparent.

If time allowed, it would be of interest, perhaps, at this point, to give some statistics relative to the great collections of insects in museums or in private hands, but further estimates and figures would probably weary you, and I shall, therefore, hasten to the conclusion of this paper.

Conclusion.

It is no longer necessary for the student of entomology to defend his favorite science. The world at large has come to appreciate the importance of such studies and the benefits which may be derived therefrom, both in matters of economics and as a means of appreciating and understanding the general laws which affect all nature.* In the light of present conditions, therefore, it is interesting to recall the estimation in which the entomologists were held by their contemporaries of the early days. That he was considered "queer" goes without saying. That he was liable to the charge of actual lunacy was demonstrated by not infrequent experience, and in some quarters of the world, for that matter, such views have not entirely disappeared. Illustrating some of these inconveniences of the early days is the incident reported, on the authority of Kirby and Spence, by Moses Harris, who records an attempt in the 17th century to set aside the will of a certain Lady Glanvilles on the ground of lunacy as evinced by no other act than her fondness for collecting insects, and it was necessary for John Ray, the great zoologist of that period, to appear at Exeter during the trial as a witness to her sanity.

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* Referring to his own career as a collector and that of two or three others who afterwards became famous, Darwin says: "It seems, therefore, that a taste for collecting beetles is some indication of future success in life!"

The great significance of small things has come to be appreciated in the present generation more than any other, and Ray's evident feeling that animals are important in proportion to their bigness, as indicated by his remark in connection with his estimates of the number of species of animals, finds no place in the present generation. The small things are now the important ones, and the student of microscopic forms of life has a much more useful field than the student who investigates the grosser forms. Size is not so significant as number, and in this respect insects hold the mean position, and with them it is true also that the smaller species are usually the more important ones, both economically and as objects of scientific study.

In the various fields of biologic investigation which have resulted from the work of such men as Darwin, Wallace, and Weismann, insect studies have played a very important part. The vast number of species, the ease with which they can be collected and studied, their short life-periods and fecundity, all are phases which greatly facilitate the investigation of such problems as those of Heredity, Protective Resemblance, Dimorphism, Natural Selection, Zoogeography, and various other matters connected with biogenesis.

It is an interesting fact also that the great names in zoological science are either of entomologists or of persons who were greatly interested in the study of insects. Aristotle, Ray, Linné, Cuvier, Lamarck, Darwin, Wallace, and many others who have been epoch-makers in the science of zoology were enthusiastic students of insects.

Other than the more purely scientific side is the practical or economic phase of the study of insects. This field I shall not enter. It has already been covered very largely by the paper by Dr. Howard cited at the outset, but I simply wish to call attention again to the very great interest in this department of the study of insects which characterizes the present generation and to refer in this connection to a remark of Réaumur's way back in the early history of entomology in which he commends a course of procedure which is pertinent at the present day. He says that "it seems to me that the insects which fall under our eyes most often are the ones which we ought most to study. They are the ones,

so to speak, with which we have to live." It was on this basis that he carried out his great work on insects, and it is a fact, which we are beginning to appreciate more in recent years than formerly, that we often know very little about common insects or those, as Réaumur says, with which we have to live, and that in the species which we meet every day is a field for study and investigation that is often almost unworked. Of the millions of species which exist in the world a vast percentage of them have little importance other than that of filling the gaps in some system of classification, and it seems reasonable, therefore, to urge the importance of working on common insects, especially in view of the fact that it will be hundreds of years before any complete knowledge of the whole field can be gained. The classifications and descriptions of to-day, on which have been expended vast time and energy, will be antiquated in a few years with the advance of science and discovery of new forms, and their places will be taken by new systems of classification and new descriptions. That an at least equal permanency and a greater practical value attaches to work in the lines of investigation of life histories and habits of common species and studies of anatomy and the more general problems of biology, is the opinion of the writer. These questions, however, are perhaps controversial and it is probably unwise to introduce them.

The address was discussed by Messrs. Gill, Ashmead, Howard, Kenyon, and Schwarz. All of the speakers congratulated the President upon his address and thanked him for the pleasure he had given the Society.

Dr. Gill combated the idea that Aristotle derived any great benefit from his association with Alexander the Great. A close study of Aristotle's works shows no basis for the statement, which was derived from the writings of later authors. All of the forms described by Aristotle from specimens are familiar Grecian forms. Everything which was not Grecian was described from hearsay. That Alexander gave Aristotle 8 talents in gold (amounting to about one million of dollars) is manifestly

absurd, since this sum of money exceeded the entire revenue of Macedonia. In the following period Dr. Gill would give more attention to the writings of Gesner than to those of any of his contemporaries. Gesner was the first to give generic names, and his descriptions were more detailed and of a better character than those of other writers of the period. In the Ray period he would give prominence to Lister as a writer rather than as but an editor of Ray's works. In periods 4 and 5 he would make a marked distinction between the servile followers of Linné and those who thought for themselves, as Fabricius, for example, who started the movement which perhaps culminated in Latreille, the author who first conceived the idea of a family in zoology.

As to the estimate of the number of species of animals, he expressed great scepticism concerning the correctness of Riley's estimate of ten millions. We know most of the mammals and birds of civilized regions, and although the fishes and mollusks of the deep seas are perhaps not more than half known, it is out of the question to consider, for a moment, that we know only 2½ per cent. of the species which exist on the globe. He further mentioned an estimate of the number of species which had been overlooked by Mr. Marlatt, viz., that of Agassiz, in his "Elements of Zoology." He further called attention to the important anatomical work of Strauss-Durckheim.

Mr. Ashmead spoke briefly, emphasizing the influence of Ray's system on modern systematic entomology. He thought that Ray is not sufficiently appreciated to-day and some of his work still holds.

Mr. Howard discussed briefly some of the authors mentioned by Mr. Marlatt, giving a few additional facts of general interest, referring, among others, to the fact that two great-great-grandsons of Jacob Schaeffer are living in Washington to-day. He criticised mildly the method of computation of the amount of entomological literature in existence, particularly the method of computing from the titles in the Zoological Record, and stated that in his opinion the estimate of 12,000 volumes of 500 pages each is too high. This statement was at once attacked by Dr. Gill and by Mr. Marlatt, who gave reasons for considering the estimate as not at all too high, and, in fact, possibly too low.

Mr. Kenyon expressed himself as glad to have his table of

known species, published in the American Naturalist a year ago, confirmed by Dr. Gill and Mr. Marlatt. He spoke of the work of the new school of biologists which will unquestionably unsettle classification in many important respects, so that we are at the present time in an uncertain position.

Mr. Schwarz stated that no prominence must be given Pliny as a naturalist. It appears that the Romans had no natural-history sense whatever. Pliny was not a naturalist, but for many years was a collector of notes from Greek authors. It is as a preserver of these notes solely that he must be remembered.

Discussing the question of the number of species yet to be described, Mr. Ashmead spoke of the extremely small proportion of the micro-hymenoptera which have yet received attention. New species may be everywhere found, even in the best known localities. In his monograph of Proctotrypidæ three-fourths of the forms treated were new. Yet he considers that this monograph contains not a sixth of the forms which exist in America. He spoke of Mr. Cockerell's recent monograph of the genus Perdita as illustrating the condition of some of the groups of aculeate hymenoptera.

Mr. Schwarz illustrated an important element which must enter into the question of the number of species by speaking of the genus Carabus. In Europe 50 years ago a certain number of species, represented by, say, 3,000 specimens in collections, were recognized by the best Coleopterists. To-day most of the varieties of the same number of species are recognized as valid species and the total number of species has more than quadrupled out of the same number of specimens. How can we estimate the number of species if our conception of what is a species be constantly varying?

MARCH 18TH, 1897.

President Marlatt in the chair, and Messrs. Heidemann, Pratt, Karlsioe, Linell, Gill, Benton, Patton, Busck, Schwarz, Ashmead, Johnson, Motter, and Howard also present.

The following new corresponding members were elected: Mr.

Frederick Blanchard, Tyngsboro, Massachusetts; Mr. August Merkel, 13 Broadway, New York city; Mr. Malcolm Burr, "Bellagio," East Grinstead, Sussex, England.

—Mr. Schwarz announced the death of Dr. John Hamilton, of Alleghany city, a corresponding member.

—Under the head of "Short notes and exhibition of specimens," Mr. Ashmead showed specimens of *Halobatopsis beginii*, recently described by him in the Canadian Entomologist.

—Dr. Motter read a letter from Dr. Wyatt Johnson, of Quebec, giving an account of the investigation of the fauna of cadavers in Canada, which had been carried on by the writer and Dr. George Villeneuve, showing a considerable correspondence with the results obtained by Mégnin in Europe. He also read a letter from Garry de N. Hough, of New Bedford, giving an account of investigations in the same direction. Dr. Motter showed that the results obtained by these investigators differed considerably from his own, and accounted for this difference by the fact that the Canadian workers had experimented mainly with exposed human bodies, Mr. Hough had studied mainly the exposed bodies of animals, while he himself had studied in the main interred bodies.

—Mr. Heidemann exhibited specimens of *Fitchia nigrovittata*, *F. aptera*, and *F. spirosuta*, the first two from the District of Columbia, and the last from Fortress Monroe.

—Mr. Busck exhibited six larvæ of *Anthrenus varius*, each of which showed well-marked wing-pads on the second and third thoracic segments. In discussing these specimens, Mr. Schwarz stated that most monstrosities are retrograde in their character and that anticipatory monstrosities such as those shown by Mr. Busck are very rare. He called attention to the parallel case recently published by Dr. Richard Heymons, of Berlin, in which similar wing-pads had been found in the larvæ of *Tenebrio molitor*. Mr. Pratt said he had occasion to examine recently many hundreds of larvæ of *T. molitor* and had not found any such cases. Mr. Howard referred to the fact that while Dr. Heymons was inclined to explain the appearence of the wing-pads of the larvæ of the meal worm as anticipatory of the pupal condition, he also mentioned the possibility that they were atavistic in their significance. Mr. Ashmead was inclined to think that the latter theory may be the correct one.

—The Secretary read the following note, submitted by Mr. T. D. A. Cockerell:

INSECTS IMPALING THEMSELVES.

By T. D. A. Cockerell.

While the insects impaled on thorns by shrikes are familiar objects, it seemed to me, when the subject was under discussion, that the probabilities of an insect ever impaling itself must be very slight. Therefore, it seems worth while to bring before you a couple of instances just communicated to me by eye-witnesses, whose veracity I do not in the least doubt. Mr. C. W. Alexander tells me he has seen the big lubber grasshopper—which is common in this region—impale itself on the sharp leaf of the broad-leafed Yucca at the Gold Camp, near the Organ Mountains. Mr. R. E. Condit, when driving by Coats Creek, in S. W. Colorado, found numbers of large black crickets which, in their haste to escape from the feet of the horses, jumped against the cacti lining the road, and many of them were impaled on the spines.

—The following paper was presented by Mr. Ashmead:

DESCRIPTIONS OF FIVE NEW HYMENOPTEROUS PARASITES ON CANARSIA HAMMONDI (RILEY).

By William H. Ashmead.

The descriptions of the following new species were drawn up some two years ago at the request of Prof. S. A. Forbes, of the Illinois State Laboratory of Natural History, to accompany an article by Prof. W. G. Johnson, on the habits of *Canarsia hammondi*, and represent only a small proportion of the parasites reared from this moth.

Family Ichneumonidæ.

Spilocryptus Thomson.

Spilocryptus canarsiæ, sp. n. [Fig. 4.]

♂.—Length 6 mm. Head and thorax black, shining, clothed with a sparse whitish pubescence, the thorax rather closely punctate, with distinct parapsidal furrows, the head almost smooth, with some minute punctures on cheeks; face, except two black lines extending forward from base of each antenna, the clypeus, except the extreme apical margin which has a medial emargination, the mandibles, except the teeth, mouth-parts, ex-

cept basal joints of maxillary and labial palpi, the inner orbits on frons, interrupted opposite the lateral ocellus, a small line behind the eyes, a spot on scape beneath, the scutellum, except at base, the postscutellum, the tegulæ, a spot beneath and before, a line before anterior coxæ, the basal margin of prosternum, a large spot beneath the anterior and the middle coxæ and their trochanters, tibiæ and tarsi *outwardly* and the hind tarsi, except basal half of first joint and the last joint, all white; the anterior and middle femora, tibiæ and tarsi *beneath* and the extreme base of

FIG 4.—*Spilocryptus canarsiæ.*

hind femora, including part of trochanters, are brownish-yellow; abdomen, except the last dorsal segment and the very broad genital sheaths which are black, rufous; the petiole is a little longer than the second segment, the third segment a little shorter than the second, the fourth about half the length of the second, the following gradually shortening; wings hyaline, the costæ and stigma fuscous.

Hab.– Champaign, Ill

Types in Coll. Illinois State Laboratory of Natural History and my collection.

Described from a single ♂ specimen bred September 15, 1894, from a cocoon of *Canarsia hammondi*, by W. G. Johnson, and several specimens in my collection taken at Washington, D. C., and elsewhere.

The species comes closest to *Cryptus nigricornis* Prov.

Limneria Holmgren.

Limneria (Sinophorus) canarsiæ, sp. n. [Fig. 5.]

♀.—Length 5 mm.; ovipositor 1.5 mm. Black, finely punctate; mandibles, palpi and tegulæ, yellowish-white; legs reddish-yellow, the hind coxæ, the first joint of their trochanters, extreme tips of their femora, a subbasal band on tibiæ and their tips, and their tarsi, black; an annulus

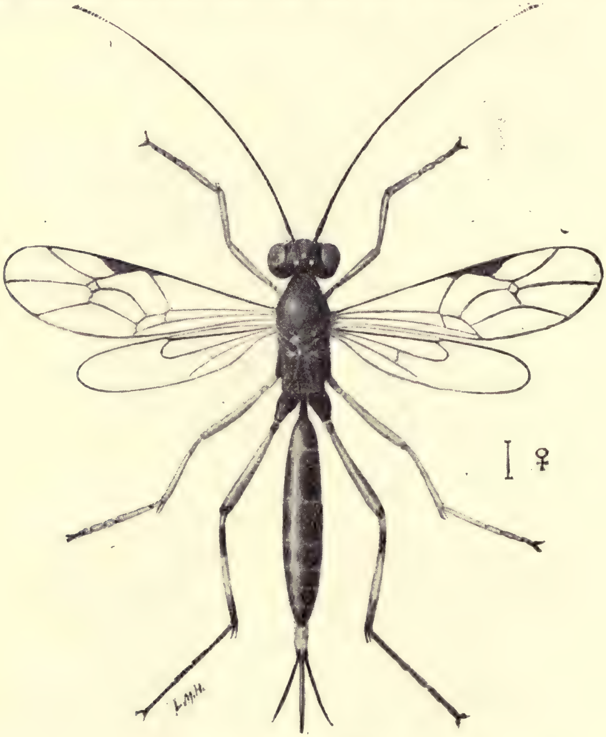

FIG. 5.—*Limneria canarsiæ.*

at base of the hind tibiæ, a broad band at their middle and the base of first and second tarsal joints, white; claws pectinate; wings hyaline, the costæ, except toward base, and the stigma fuscous, the internal veins paler; areolet distinct, subsessile.

Hab.—Normal, Illinois.

Type in Coll. Illinois State Laboratory of Natural History.

Described from a single ♀ specimen bred July 23, 1886, from *Canarsia hammondi*, by C. M. Weed.

This species in general appearance comes nearest to *Limneria annulipes* Cr. and *L. pterophoræ* Ashm., but it is larger and readily separated by the subsessile areolet, pectinate claws, and by the color of the anterior and middle coxæ and trochanters. It belongs evidently in Förster's subgenus *Sinophorus.*

Family Braconidæ.

Apanteles Förster.

Apanteles canarsiæ, sp. n. [Fig. 6.]

♀.—Length 2.1 to 2.25 mm.; ovipositor prominent, about two-thirds the length of abdomen. Black, shiny, pubescent, finely, closely punctate, the

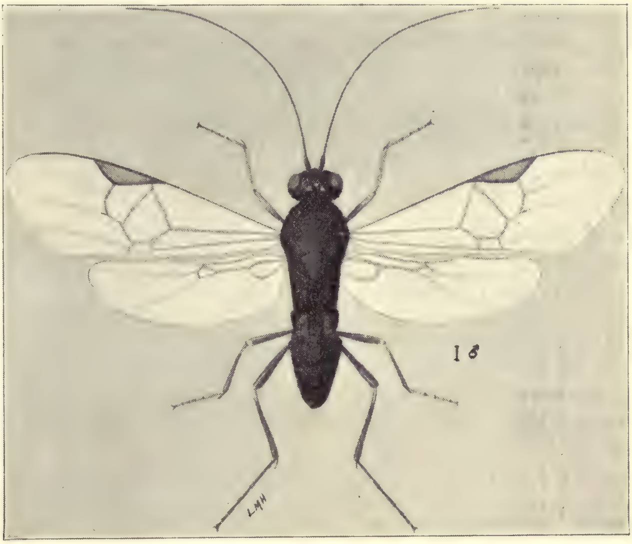

Fig. 6.—*Apanteles canarsiæ.*

occiput, temples posteriorly, and the posterior half of the mesopleura and the metapleura smooth, shining, impunctured. The thorax above is subopaque, closely punctate; palpi white; second joint of anterior trochanters, apical half of anterior femora, and their tibiæ and tarsi, except last joint, knees of intermediate legs, base of their tibiæ and tarsi, except last joint, basal two-thirds of hind tibiæ and an annulus at extreme base of their tarsi, honey-yellow; all tibial spurs white. Metathorax transverse quadrate, smooth, shining, with a large well-defined rhomboidal or

hexagonal median area. Abdomen as long as the thorax, the ventral valve very large, plowshare-shaped, and projecting considerably beyond the tip of the abdomen, the ovipositor long; plate of first segment about twice as long as wide, with the sides parallel, the apical corners slightly rounded, shagreened, and with a longitudinal median sulcus towards apex; second and third segments nearly smooth, at the most feebly shagreened, the second very short, about half the length of the third, with oblique grooved lines at basal lateral margins, but so widely separated and so close to the lateral margins as to be easily overlooked; fourth segment a little shorter than the third, the fifth a little longer than the fourth, the following very short. Wings hyaline, the costa and stigma dark brown or fuscous, the internal veins hyaline, the areolet open behind, the inner margin of same being about half the length of the first branch of the radius, while the submedian cell is one-half the length of the discoidal cell longer than the median cell.

The male agrees very well with the female, except in the usual sexual differences, and in having the antennæ much longer than the body, the hind tibiæ is yellow only at base, and the tarsi entirely black, while the costæ and stigma, except outer margin, and the postmarginal, are white, the membranous lateral margins of the first segment being piceous.

Hab.—Normal, Illinois.

Types in Coll. Illinois State Laboratory of Natural History and Coll. Ashmead.

Described from several specimens, representing both sexes, bred from the larva of *Canarsia hammondi*, August 10–14, 1894, by W. G. Johnson.

In my forthcoming monograph of the North American Braconidæ, I have divided the genus Apanteles into five principal sections, based upon characters derived from the metathorax, and these again are separated into divisions based upon the shape of the plate or shield on the first segment, and the length and sculpture of the following segments—important characters entirely overlooked by previous writers on the group, although offering excellent characters for the separation and the ready identification of species.

The present species belongs to my Section I, and comes nearest to *A. carpatus* Say and *A. edwardsii* Riley, but is quite distinct from both, in color of legs, and in sculpture and relative length of the abdominal segments.

Family Chalcididæ.

Elasmus Westwood.

Elasmus meteori, sp. n. [Fig. 7.]

♀.—Length 1.6 mm. Æneous-black; abdomen mostly rufous, the third and fourth segments above with a transverse black band at apex, the fifth

with a black band at base, the sixth and seventh segments and ovipositor sheaths entirely black; scape white, flagellum brown, pubescent, about one and a half times as long as the scape; pedicel and first funiclar joint with ring joint, of an equal length, the second joint of funicle slightly the shortest joint, the third a little longer and stouter than the second; legs mostly white, but clothed with a black pubescence; anterior coxæ with a triangular black spot at base a little toward one side, their femora with a row of short black bristles within and along the posterior margin; middle femora, except at base and apex, black, their tibiæ with two straight rows of bristles outwardly, their tarsi blackish from the density of the pubescence; hind coxæ and femora outwardly black, their tibiæ and tarsi white, but somewhat obscured by the pubescence; the pubescence on the hind margin of the tibiæ is arranged to form about seven links of a chain,

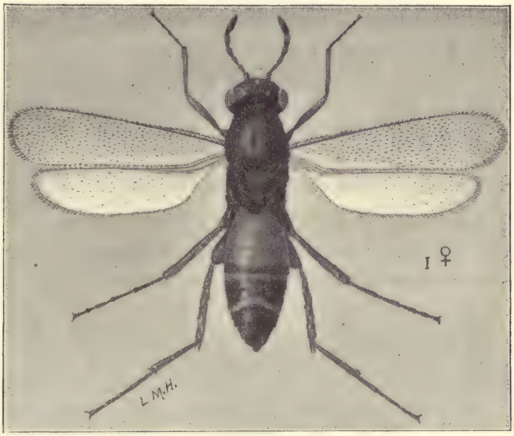

FIG. 7.—*Elasmus meteori.*

the first and last links or areas being small, while the pubescence on the tarsi is quite dense and entirely hides the white color, except along the hind margins of the joints.

The head, viewed from in front, is a little longer than wide, the vertex rounded, the frons convex, and with a sparse, thimble-like punctation, about as in *E. atratus* How., the facial impression distinct, extending upwards to about half the length of the head, where it terminates in a transverse ridge which sharply separates the frons from the lower part of the face; thorax nearly smooth, but with a feebly impressed reticulated sculpture; postscutellum narrowly margined with white; wings hyaline, pubescent, the marginal vein a little more than twice as long as the submarginal, the stigmal vein minute, sessile.

♂.—Length 1 mm. Entirely black or deep blue-black, except the sutures

between the articulations of the legs (coxæ, trochanters, &c.), the apex of anterior femora and all tibiæ and tarsi, are white, but appear black from the dense pubescence that cover them; the scape is æneous-black, the flagellum dark brown with three long branches; otherwise similar to female.

Hab.—Champaign and Tonti, Illinois.

Types in Coll. Illinois State Laboratory of Natural History and Coll. Ashmead.

Described from several specimens bred August 27 and September 9, 1894, by W. G. Johnson, from cocoons of *Meteorus vulgaris*, a primary parasite of *Canarsia hammondi*, and possibly also from the cocoons of *Apanteles canarsiæ* described above.

The ♀ of this species comes nearest to *E. varians* How., but the abdomen is neither so long nor acutely pointed and differently colored, while the thorax is smoother and the pubescence of legs differently arranged; the ♂, on the contrary, very closely resembles *E. nigripes* How., but the slight difference in the color of the legs and the arrangement of the bristles readily separate the species.

Tetrastichus Haliday.

Tetrastichus cœrulescens, sp. n. [Fig. 8.]

♀.—Length 1.5 mm. Steel-blue; scape æneous, the flagellum subclavate, brown-black, pubescent, the joints delicately fluted; funicle 3-

FIG. 8.—*Tetrastichus cœrulescens*.

jointed, the first joint the longest, slightly longer than the second, the third slightly shorter than the second; club fusiform, 3-jointed, a little longer than the last two joints of funicle united and stouter; tips of femora, and the tibiæ and tarsi, except two last joints, white, the two

terminal joints of tarsi fuscous, while the hind tibiæ toward base behind has a slight brownish blotch or spot; abdomen conic-ovate, pointed at tip, a little longer than the head and thorax united; wings hyaline, the venation pale brown; otherwise the characters are typical of the genus.

♂.—Length 1.2 mm. Agrees with the ♀, except the funicle is 4-jointed, the abdomen being oblong-oval, cylindric, not longer than the head and thorax united.

Hab.—Champaign, Ill.

Types in Illinois State Laboratory of Natural History.

Described from 1 ♂ and 1 ♀ specimen bred September 6 and 21, 1894, by W. G. Johnson, from *Habrobracon* (*Bracon*) *gelechiæ* Ashm. and the primary parasite of *Canarsia hammondi*.

In discussing this paper, Mr. Johnson spoke of the great injury which *Canarsia hammondi* had done to young apple trees in McLain county, Illinois. In one season damage to the amount of $1,500,000 had been done. One block of trees containing 125,000 had been completely destroyed. He found, among other interesting facts, that this insect pupates in the ground and not in the leaves, so that Riley's recommendation to burn the leaves as a remedy is ineffective. In the course of his investigations, he reared 13 species of parasites, all but one of which were hymenopterous. Of the 12 Hymenoptera, 10 were primary parasites. He gave some rearing notes concerning these 10 species and showed that *Habrobracon gelechiæ* was the most important, and constituted in number of specimens four-fifths of all which were reared. The habits of this species were given in full, showing that only 12 days elapsed in the development of the insect from the egg to the adult. Among other species, he mentioned a Perilampus as a primary parasite, and this record was at once questioned by Mr. Howard, who suggested that the insect was more likely to have been a parasite of the Chrysopa which had crawled into the Canarsia cocoon to spin its own cocoon.

Mr. Johnson stated that he had not examined the Canarsia cocoon from which this insect emerged. Mr. Ashmead considered it more likely that the Perilampus had been a parasite upon the dipterous parasite reared by Mr. Johnson.

—The following paper was read:

A NEW SPECIES OF ROPTRONIA.

By William H. Ashmead.

The following new species in the rare genus *Roptronia* Prov. was taken by Prof. H. Garman, of the State College of Kentucky, at Lexington, Ky., and after whom I take pleasure in naming the species.

The genus, as originally described, was placed by Abbé Provancher in the family *Braconidæ*, but was subsequently removed by him to the subfamily *Helorinæ* in the *Proctotrypidæ*. From the imperfect figure of the venation given by Provancher, and before I had seen a specimen for examination, I was inclined to doubt the correctness of this last view of the learned Abbé's, and placed the genus doubtfully among the aberrant group *Pachy lommatinæ* in the Braconidæ. Since that time, however, I have seen three representatives of the genus, and a careful study of these specimens convinces me that Provancher was correct in removing the genus to the Helorinæ. The venation is somewhat similar to the genus *Monomachus* Westw., and seems to afford a connecting link between this genus and the genus *Proctotrypes* Latr.

Monomachus should also be placed with the Helorinæ.

Roptronia garmani, n. sp.

♂.—Length 7.5 mm. Black; head and thorax rugoso-punctate, pubescent; front coxæ, except a spot at base beneath, trochanters, except spot above, tips of femora and anterior tibiæ and tarsi, spot at apex of middle coxæ, second joint of trochanters, tibiæ beneath and narrowly at base and apex and their tarsi, second joint of hind trochanters and basal one-third of hind tibiæ, pale ferruginous or pale yellowish; tegulæ and prothoracic tubercles ferruginous. Head transverse-quadrate, the temples as wide as the eyes; mandibles dull ferruginous, bidentate at apex, the upper tooth longer than the lower; maxillary palpi 5-jointed, labials 4-jointed, the last joint dark fuscous. Antennæ 14-jointed, filiform, tapering off at apex. Thorax, with the mesonotal furrows rather broad, distinct, slightly crenulate, especially posteriorly; metathorax rugose, rounded off posteriorly, the spiracles small oval. Abdomen with a long petiole, the petiole being fully as long as the hind femora, or slightly longer, shining, but fluted above, and somewhat rugose basally, smoother and punctate towards apex and beneath, pubescent, body of abdomen compressed, viewed from the side somewhat triangular, about as long as the petiole, highly polished, the first segment occupying fully two-thirds the whole length, the following segments short, subequal.

Hab.—Lexington, Ky. (Prof. H. Garman.)

Quite distinct from *R. pediculata* Prov. in its much larger size and in the color of legs and abdomen. In *R. pediculata* the abdomen is red, the hind legs black, &c.

I add below the description of another species discovered among the collection of *Braconidæ*, belonging to the American Entomological Society, now in my hands for examination and study.

Roptronia californica, n. sp.

♂.—Length 5.5 mm. Pale ferruginous; spot on vertex enclosing the ocelli and extending forward to base of antennæ, occipital foramen, clypeal spiracles, prothorax above anteriorly and beneath, mesopleura, metathorax and abdominal petiole, black; eyes brown; antennæ, except pedicel, brown, 14-jointed; legs pale brownish-yellow; wings hyaline, the stigma and veins brown.

This species structurally does not differ greatly from *R. garmani*, except in having the head, except vertex and face, the mesonotum and the scutellum, except at apex, smooth and almost impunctate; the mesopleura, except space beneath wings, are closely punctate, while the metathorax is rugose. The venation is almost identical in the two species, except in *californica*, the first abscissa of the radius is perpendicular and not longer than the width of the stigma, while in *garmani* it is oblique and more than twice longer than the width of the stigma. Another character not noted in the other two species is that the postscutellum is conically produced, viewed from the side its apex reaches an elevation above the disk of the scutellum.

Hab.—Southern California.

The three species now known in this genus may be tabulated as follows:

Head and thorax black, rugose; postscutellum normal.
  Abdomen black; legs, except tips of anterior and middle femora and their tibiæ and tarsi, mostly black. ♂. Length 7.5 mm.
    R. garmani Ashm.
  Abdomen red; legs, except coxæ and hind legs which are black. rufous. ♀. Length 6.75 mm......................*R. pediculata* Prov,
Head, except spot on vertex and frons, mesonotum, scutellum and abdomen, except the petiole, pale ferruginous; postscutellum conically elevated; legs pale brownish-yellow. ♂. Length 5.5 mm.
    R. californica Ashm.

—Mr. Howard presented the following:

ON SOME PARASITES OF COCCIDÆ, WITH DESCRIPTIONS OF TWO NEW GENERA OF APHELININÆ.

By L. O. Howard.

It had been my intention to simply submit for publication the descriptions which follow, of two new genera of Aphelininæ,

but the opportunity is a good one to make a preliminary announcement of certain facts which have come to my attention, mainly in the last year, concerning the interesting geographic distribution of certain species of scale-insect parasites.

When I first began the study of hymenopterous parasites of scale-insects, in 1879, although I had abundant material at hand from the United States, all of the Aphelininæ studied were comprised in the genera Aphelinus and Coccophagus. In 1880 I published descriptions of 13 species of these two genera, adding in 1885 three others. Ten years later, in going over accumulated material for the purpose of revising the subfamily, it became evident that new elements had entered our fauna. Several genera not previously recognized in the United States were found to be abundantly represented and several of them were described as new. In late years, in point of fact, the formerly abundant species of Aphelinus have apparently become rarer and rarer, while their place has been taken by Aspidiotiphagus, Prospalta, Perissopterus, Ablerus, and Encarsia.

The great interest which has sprung up of recent years in the study of the Coccidæ in different parts of the world, largely arising from the great economic importance which these insects are assuming, has resulted in the gradual accumulation at Washington of parasitic forms from many different parts of the world, and their study is already revealing many points of interest. As is quite to be expected, several of these parasites have accompanied their Coccid hosts in their commercial distribution to widely separated countries on plants, nursery stock and fruit, and seem to have as readily accommodated themselves to varying conditions of climate as have their hosts. A careful study of these forms and their distribution will be a labor of years, but certain facts already accumulated will be of interest.

Aspidiotiphagus citrinus (Craw) is a species which was unknown in this country, and, in fact, unknown to science, prior to 1891, when it was described by Mr. Craw, under the name *Coccophagus citrinus*, in a pamphlet published at Sacramento, entitled "Destructive Insects." Since that date, this species has come to me in hundreds of examples from 18 distinct species of scale-insects and from the following localities:

Many localities in the United States (various collectors); Grenada, B. W. I., (H. H. Smith); Portici, Italy, (A. Berlese); Punduloya, Ceylon, (E. E. Green); Kandy, Ceylon, (A. Koebele); Hong Kong and Amoy, China, (A. Koebele); Tamsui, Formosa, (A. Koebele); Yokohama, Japan, (A. Koebele); Newlands, Cape Colony, (C. P. Lounsbury); Brisbane, Queensland, (A. Koebele); Adelaide, South Australia, (F. S. Crawford); Honolulu, Hawaii (A. Koebele).

This remarkable distribution is practically followed by *Prospalta aurantii*, *Aphelinus fuscipennis*, *A. mytilaspidis* and *A. diaspidis*—all species of the writer's; some of the localities mentioned for Aspidiotiphagus not yet being noted for some, and a few additional localities being noted for others, as, for example, *A. diaspidis* from San Luis, Mexico, and *A. fuscipennis* from Natal.

Another species which has also practically this same almost

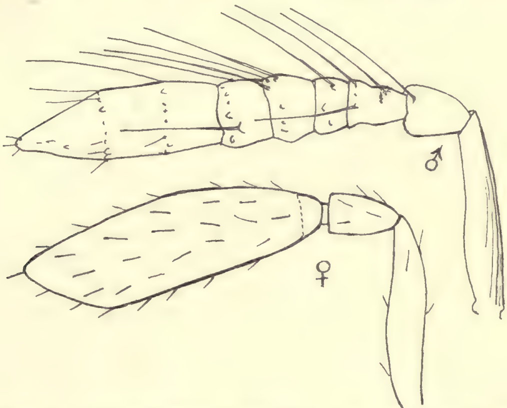

FIG. 9.—*Arrhenophagus chionaspidis;* male and female antennæ—greatly enlarged (original).

universal distribution is curiously enough *Arrhenophagus chionaspidis* Aurivillius. This extraordinary Encyrtine was described by Dr. Aurivillius in 1888, from specimens reared in the female sex only, from *Chionaspis salicis* in Sweden. The remarkable structural characters of the form attracted my attention and I wrote to Dr. Aurivillius for specimens and he was good enough to send me a large number. At the March (1895) meeting of this Society, I recorded the verification from these specimens of the characters described and figured by Aurivillius and mentioned the rearing of the same species from *Diaspis rosæ* in this country at Kirkwood, Mo., by Miss Mary E. Murtfeldt. This discovery I considered at the time a remarkable one, but later received specimens of the same species from Mr. W. G. Johnson, who had reared them from the Diaspis scale at Champaign, Ill., and later had the pleasure of rearing in Washington specimens of the same species from *Diaspis rosæ* received from Mr. R. J. Black, of Bremen, Ohio. Still later, specimens from the same host insect were received from Professor Berlese, reared at Portici, Italy, and, again, Mr.

E. E. Green, of Punduloya, Ceylon, sent specimens reared from Fiorinia. On receipt of the results of Mr. Koebele's rearings, six new localities were added, namely, Kandy, Ceylon; Atami, Japan; Tamsui, Formosa; and Hong Kong, Amoy, and Macao, China. All of the specimens examined by the writer, and there were hundreds of them, down to the very last slide from the last named locality, were females, and it was, therefore, a great pleasure to find a single specimen from Macao reared from *Chionaspis eugeniæ* which represented the hitherto unknown male. The identity is unmistakable and the male differed from the female, as was quite to be expected, only in the antennæ. Instead of being 3-jointed, as are the antennæ of the female, those of the male are 9-jointed, 4 of the joints belonging to the funicle, as represented in the accompanying figure. Thus, although originally described from Sweden, and next found in the United States, it becomes probable that Arrhenophagus is an oriental form.

Other curious occurrences of this nature have come to me. Thus, in the autumn of 1896, I described a remarkable Coccophagus reared by Mr. Green in Ceylon from several Lecaniine scales as *Coccophagus orientalis*. Within a week after the description was published specimens of the same species were received from Mr. H. A. Morgan, at Baton Rouge, La. The species of the new genus Azotus, a description of which follows, is another similar instance. A unique example was received in December last from Dr. Paul Marchal, of Paris, who had reared it from the common European *Diaspis ostreæformis* the previous June. After the description of the new genus was drawn up, a single example (the second one known) of the same species was received from Mr. Wm. M. Maskell, of New Zealand, who had reared it from *Aspidiotus nerii* received from Sidney, New South Wales. From such instances it will be seen that at the present time with many of these parasites it is quite as hopeless a task to endeavor to ascertain original home as it is to ascertain the same for their hosts.

ARCHENOMUS, new genus.

Male.—Tarsi 4-jointed. Antennæ 8-jointed, subcylindrical, pointed at tip, pedicel somewhat broader than other joints, joints 1 and 3 of funicle long, joint 2 very short; club 3-jointed, attenuate. Body short, stout; mesoscutar parapsides moderately long; mesoscutellum broad and short, much flatter before than behind. Fore-wings broad with a long fringe which is shorter at apex than on outer costal margin; marginal vein very heavy, a little more than one-third the length of the submarginal

and bearing 10 marginal bristles; postmarginal absent; stigmal very short and curving very slightly into disc of wing, about as with Prospalta, and ending at about one-half the wing length. Legs stout, femora somewhat swollen, tarsal joints 1, 2 and 4 subequal in length, 3 somewhat shorter; hind tibiæ with a single spur, nearly as long as first tarsal joint; middle tibiæ each with two minute apical spurs.

Female.—Differs mainly in antennæ. Funicle joints 1 and 2 small, subequal in length, little wider than long, each shorter than pedicel; 3 as long as 1 and 2 together; joint 1 of the long club longer than the other two joints, which are subequal in length. Entire flagellum subcylindrical, pedicel not swollen.

Archenomus bicolor new species.

Female.—Length .7 mm; expanse 1.5 mm; greatest width of fore-wing .25 mm. Funicle joints 1 and 2 small, little wider than long, each about half length of pedicel; funicle joint 3 as long as 1 and 2 together; club

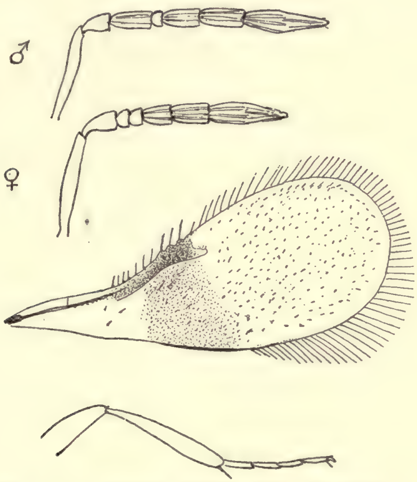

FIG. 10.—*Archenomus bicolor;* male and female antennæ, fore wing and hind leg—greatly enlarged (original).

3-jointed, joint 1 longest, 2½ times as long as 3rd funicle joint; joints 2 and 3 subequal, 3 acuminate at tip. General color dark brown; head dark yellow; scutellum light yellow, axillæ brown; margin of mesoscutum and its parapsides dark orange-yellow; tip of abdomen sometimes yellowish; all legs pale, except slight dusky shades on middle of femora and at base of tibiæ; basal half of wings infuscated; wing veins dark brown, eyes reddish.

Male.—Resembles female, except in generic and sexual characters.

Type.—No. 3646, U. S. N. M.

Described from many male and female specimens reared by Professor Paul Marchal, of Paris, from *Diaspis ostreæformis* on pear, June, 1896.*

AZOTUS, new genus.

Male.—Tarsi 5-jointed; antennæ 8-jointed; club 2-jointed; joint 3 of the funicle much shorter than other funicle joints; anterior wings without oblique hairless line; head not quite as broad as thorax; mesoscutellum not quite as broad as scutellum, twice as broad as long; axillæ and mesoscutar parapsides about as in Eretmocerus; marginal vein a trifle shorter than submarginal; stigmal well marked, descending at an angle of about 30° into the disc of the wing; club not large; postmarginal absent; fore-wings with rather long marginal cilia regularly increasing in length from point just beyond stigmal vein to anal angle; marginal vein of fore-wings with three long bristles and four shorter ones; one on submarginal and one short one at juncture of submarginal with marginal. Hind femora somewhat swollen. Middle and hind tibiæ each with a rather long apical spur. That on middle tibia longer.

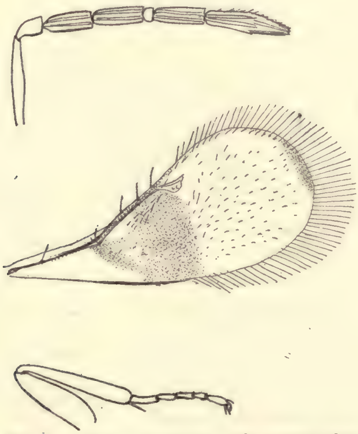

FIG. 11.—*Azotus marchali;* male antennæ, fore wing and hind leg—greatly enlarged (original).

*Just as this is going to the printer 4 specimens of the female of this species have been received from F. M. Webster, of Wooster, O., who reared them from *Diaspis amygdali* recently received from Japan. Six females were also reared from an Aspidiotus on sweet gum from Savannah, Ga. The writer also possesses several badly damaged specimens of what is probably this species, which were reared, by Mr. E. E. Green in Ceylon, from *Chionaspis vitis.*

Azotus marchali new species.

Male.—Length .44 mm.; expanse 1.4 mm.; greatest width of fore-wings .23 mm. Fore-wings with longest marginal cilia a trifle more than one-third wing width; discal cilia regularly distributed except that there is a triangular clear space below marginal vein and another below stigmal; hind wing with two irregular incomplete rows of discal cilia; marginal cilia about as long as the wing breadth; fore-wings rather irregularly infuscated on basal half; antennal scape slender; pedicel short; funicle joints 1, 2 and 4 subequal in length, 1 slightly longer, each much longer than pedicel; funicle joint 3 very short, as broad as long, about one-fifth as long as 2; club nearly twice as long as funicle joint 4, about five times as long as broad. General color brown, face yellowish, femora light at tips, tibiæ light at either end, tarsi nearly white except basal and terminal joints; antennæ light brown; eyes bright red.

Type.—No. 3647, U. S. N. M.

Described from one specimen, apparently a male, reared by Prof. Paul Marchal, of Paris, June, 1896, from *Diaspis ostreæformis* on pear, together with many specimens of *Archenomus bicolor*, to the male of which it bears a superficial resemblance, but from which it is immediately separated by its 5-jointed tarsi. Later a single specimen was received from Mr. Wm. M. Maskell, which he had reared from *Aspidiotus nerii* on *Baloghia lucida*, received from Sidney, N. S. W.

In discussion Mr. Ashmead expressed great interest in the paper and congratulated the author both on the discovery of the male of Arrhenophagus and upon the remarkable facts ascertained concerning its distribution. He stated that the paper illustrated well the impossibility of mapping the geographical distribution of parasitic Hymenoptera, since these insects always follow their hosts. Mr. Schwarz expressed a disagreement with Mr. Ashmead and thought that such extraordinary instances of distribution as these referred to by Mr. Howard could hold only with the parasites of scale-insects. If Mr. Ashmead's claim were true we could import parasites from many portions of the world with the certainty that they would acclimatize themselves. Mr. Ashmead stated that the rule would hold for other parasitic Hymenoptera as well as for the parasites of scale-insects, and instanced many species which he had found to be cosmopolitan, stating that we probably have many more, but that the specific study of these

creatures has not allowed us hitherto to recognize the distribution. Mr. Schwarz said that this statement was not surprising and did not vitiate his contention, since with the Hymenoptera there must necessarily be cosmopolitan species, and probably many of them, just as there are with the Coleoptera. Mr. Ashmead stated that he referred only to parasitic Hymenoptera in his remarks, but called attention to the honey-bee as an example of a widely distributed aculeate, whereupon Mr. Schwarz said that the honey-bee was a domestic animal and thus beyond the pale of geographic limitations. Mr. Howard stated that if Mr. Ashmead were right in his statement that the parasites will follow their hosts in extending their geographic distribution, it by no means complicates the question, but really simplifies it, since we have only to ascertain the distribution of hosts and duplicate it for parasites. Mr. Ashmead expressed his dissent to this view since the parasitic relation changes under new conditions and the same parasite may affect different hosts in new regions. His contention was simply that the parasitic Hymenoptera appear to be less affected by climatic change than are other insects.

—The following paper, by Mr. W. J. Fox, was read by title:

THE SPECIES OF PEPSIS, INHABITING AMERICA NORTH OF MEXICO.

By William J. Fox.

The recent monograph of the hymenopterous genus Pepsis* by Robert Lucas induced the present author to work up the material of that genus in the collection of the American Entomological Society, with the result of bringing to light several entirely new species. The synoptical tables are given herein with the thought that Lucas' work is not accessible to all American hymenopterists, and are practically identical with those of Lucas, except that the new species are interpolated and some minor points added.

Pepsis marginata and *Sommeri*, which have been recorded by several authors as occurring in the United States, are not included in the present paper. It is doubtful in my mind if these

*Berliner Entomologische Zeitschrift, xxxix, Heft 4, pp. 449, *et seq.*, (1894) 1895.

species occur north of Mexico, although, of course, such is not an impossibility.

FEMALES.

Wings black, more or less resplendent with purple or blue............ 2
Wings more or less red or yellow... 3
2. Antennæ orange from the second joint; wings not pale at tip. Length 25–27 mm...ELEGANS Lep.
Antennæ entirely black; apical margins of wings pale or subhyaline. Length 38–50 mm......................................OBLIQUERUGOSA Luc.
3. Apical margin of wings pale or subhyaline.................................. 4
Apical margin of wings not subhyaline.. 6
4. Wings more or less darkened apically, before the pale apices......... 5
Wings pale yellow-brown, almost yellow; distance between eyes at top about equal to length of first joint of flagellum. PALLIDOLIMBATA Luc.
5. Wings faintly darkened apically, almost yellow, the subhyaline apices distinct..FORMOSA Say.
Wings reddish-yellow, with a broad, blue-black margin, which extends into the marginal, third submarginal and third discoidal cells, the subhyaline apices indistinct.................................NEPHELE Luc.
6. Antennæ from the apex of the third joint orange or brownish (base and apical margin of the wings distinctly darkened)...MILDEI Stal.
Antennæ entirely black, or the pale color is restricted to apical joints 7
7. Wings fiery-red, with pale fuscous margins; middle segment with strong transverse median fold (Medianquerleiste). CINNABARINA Luc.
Wings paler, more yellowish, the margins distinctly darkened......... 8
8. Middle segment with a feeble transverse median fold (Medianquerleiste), not dentate laterally; (wings almost yellow; longer spur of hind tibiæ equal to about one-third of the length of first hind tarsal joint)..INERMIS Fox.
Middle segment with a strong, transverse, median fold, dentate laterally; longer spur of hind tibiæ equal to less than one-third of the length of first hind tarsal joint 9
9. Wings yellowish, at base and apical margins strongly darkened; space between eyes at top about equal to length of second and third antennal joints; antennæ with tip of last joint orange. BOGUEI Fox.
Wings pertaining to reddish, at extreme base black, apical margins pale fuscous; space between eyes at top much greater than length of antennal joints 2 and 3; antennæ entirely black.....LUCASII Fox.

MALES.

Wings black, more or less resplendent with purple or blue............... 2
Wings more or less red or yellow 4
2. Antennæ orange from the second joint; wings not pale at tips........ 3

Antennæ entirely black; wings with apical margins white; subgenital plate clothed with long hair. Length 27-37 mm. OBLIQUERUGOSA Luc.

3. Fourth ventral segment with a lateral bunch of long curved hair; wings purplish .... ELEGANS.
Fourth and fifth ventral segments with short hair; wings bluish, shading into green and coppery apically .... CHARON Mocs.

4. Apical margin or margins of wings pale or subhyaline.................. 5
Apical margins not pale or subhyaline.................................. 8

5. Only the tips of anterior wings subhyaline; broadly fuscous at base and apically.. 6
Tips of all wings subhyaline.. 7

6. Subgenital plate crossed by a strong elevation at about middle, turned or bent downward at apex, so that viewed from the side it appears to be crossed by two strong carinæ....SANGUIGUTTA Christ.
Subgenital plate without median elevation, but bent downward at apex; sixth ventral segment covered by a large chitinous plate, the postero-lateral angles of which are drawn out into a narrow process which completely encircles the sixth dorsal segment. CIRCULARIS Fox.

7. Subgenital plate elongate, strongly punctured, clothed with long hair.. FORMOSA Say.
Subgenital plate medially with a strong production which extends laterally in the shape of a carina, apex reflexed or bent downward, so that the plate, when viewed from the side, appears to be crossed by two carinæ; it is neither hirsute nor punctured......CHRYSOTHEMIS.

8. Subgenital plate crossed by a sharp elevation at about middle, turned or bent downward at apex, so that viewed from the side it appears to be crossed by two strong carinæ (extent of black and yellow of wings variable)..CHRYSOTHEMIS Luc.
Subgenital plate without median elevation, but crossed by a carina, the apex at each side strongly produced; sixth ventral segment covered by a large chitinous plate the postero-lateral angles of which are drawn out into a narrow fold, which completely encircles the sixth dorsal segment...... ....CIRCULARIS Fox.

9. Antennæ from second joint orange (base and apical margin of wings distinctly darkened)..MILDEI Stal.
Antennæ entirely black, or the pale color restricted to the apical joints. 10

10. Subgenital plate short, spatulate, toward the base medially carinated; the hind margin rounded, fringed with hair; fourth ventral segment with two bunches of curved hair, the fifth nude; antennæ entirely black.......................................CERBERUS Luc.
Subgenital plate elongate, sides parallel, not carinated, apex subtruncate, without hair; fourth segment with two bunches of curved hair; the fifth with a transverse brush of shorter, stiff hairs; last joint of antennæ at extreme tip orange................ ...BOGUEI Fox.

1. PEPSIS ELEGANS Lep.

Pepsis elegans Lepeletier de St. Fargeau, Hym., III, 489, ♂. 1845.

Pepsis elegans Smith, Cat. Hym. B. M., III, 201, ♀. 1855.

Pepsis dubitata Cresson, Tr. Am. Ent. Soc., I, 144, ♂ ♀. 1867–'68.

Georgia; Florida; Texas. This species seems to be distinct from that described by R. Lucas as *auranticornis* and to which that author doubtfully refers it. I am of the opinion that *elegans* and *dubitata* are synonymous, and that the red color of the abdominal segments mentioned by Lepeletier in his description of *elegans* is, as suggested by F. Smith, "attributable to the iridescence of the pile . . ."

2. PEPSIS CHARON Mocs.

Pepsis charons Mocsary, Termesz. Füzetek, 1885, 225, ♀.

Pepsis charon Cameron, Biol. Centr.-Amer., Hym., II, 220, ♀ ♂.

Pepsis charon R. Lucas, Berl. Ent. Zeitschr., XXXIX, 589, Pls. 32 and 33, f. 247, ♀ ♂, 1895.

Mexico (Mocsary, Cameron, Lucas); Texas. A single male from the latter locality.

3. PEPSIS OBLIQUERUGOSA R. Luc.

Pepsis ornata Cresson and various authors (non Lep.)

Pepsis obliquerugosa R. Lucas, l. c., 576, ♀, 1895.

St. Thomas (Lucas); Cuba; Mexico; Lower California; Arizona. In the hirsute subgenital plate, the male of this species is closely allied to that of *P. grossa;* the latter however seems to be restricted to South America.

4. PEPSIS SANGUIGUTTA Christ.

Sphex sanguigutta Christ., Naturg., 293, pl. 29, f. 3, ♂. 1791.

Sphex stellata Fabricius, Ent. Syst., II, 219, ♂. 1793.

Pepsis stellata Fabricius, Syst. Piez., 214, ♂. 1804.

Pepsis sanguigutta R. Lucas, l. c., 726, figs. 42, 46, 221, ♂. 1895.

South America; West Indies; Texas.

5. PEPSIS CIRCULARIS n. sp.

♂.—Blue, with purplish reflection; wings dark brown, the medial portion of superiors including apical half of median and submedian cells, all discoidals except part of third, first and second submarginals, and marginal basally, reddish; tips subhyaline; inferiors almost entirely brown, with the middle portion of anterior margin, reddish, tips not subhyaline; antennæ black; clypeus incurved anteriorly, but not angularly so; front deeply impressed; sides of metanotum indistinctly striated, metapleura strongly striated; upper and posterior surfaces of middle segment distinctly separated, the median transverse fold (Medianquerleiste) distinct, almost reaching the sides, lateral teeth rudimentary, upper surface with the rugæ most distinct on the median and lateral longitudinal folds, the depressed portions nearly smooth; abdomen fusiform, rather robust; impression of second ventral segment indistinct, no hair on fourth or fifth ventrals, subgenital plate crossed by a carina at about the middle which then runs toward the base on each side, apex of plate at each side strongly produced, sixth ventral segment covered by a large chitinous plate the postero-lateral angles of which are drawn out into a fold which completely encircles the sixth dorsal segment; longer spur of hind tibia equal to somewhat more than one-third of the length of first hind tarsal joint. Length 26 mm.

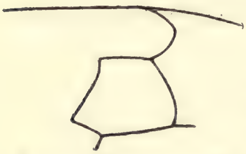

FIG. 12.—Third subm. cell, *P. circularis.*

Texas. One specimen.

6. PEPSIS FORMOSA Say.

Pepsis formosus Say, West. Quart. Reporter, II, 76, 1823; Amer. Entomology, plate 42, ♀, 1828; and various authors.
Pepsis formosa R. Lucas, l. c., 736, ♀ ♂, 1895.

Texas; Mexico (Lucas); Lower California.

7. PEPSIS NEPHELE R. Luc.

Pepsis nephele R. Lucas, l. c., 739, ♀, 1895.

Texas: Dallas (Boll). Differs from *formosa* by the broadly and darkly margined wings. Lucas says: "Is perhaps only a variation, by the remarkable color of wings, of *P. formosa* Say."

8. PEPSIS CHRYSOTHEMIS R. Luc.

Pepsis chrysothemis R. Lucas, l. c., 739, figs. 85, 86, 92, 133, ♂, 1895.

Mexico (Lucas); Texas; Oklahoma (E. E. Bogue); California (O. B. Johnson); Lower California (C. D. Haines, in May).

9. PEPSIS PALLIDOLIMBATA R. Luc.

Pepsis pallidolimbata R. Lucas, l. c., 745, fig. 164, ♀, 1895.

Northwest America (Lucas). The locality given by Lucas for this species is rather obscure, and I am therefore in doubt as to the identification of a specimen from Texas, which agrees very well with the description, except that the inner spur of hind tibiæ is equal to about one-quarter of the length of the first hind tarsal joint, and not two-fifths as described by Lucas. The length of this spur, however, is not always constant.

10. PEPSIS MILDEI Stal.

Pepsis Mildei Stal, Ofversigt Vetensk. Akad. Förhandl., XIV, 64, 1857; R. Lucas, l. c., 777, 1895.
Pepsis hesperiæ Patton, Proc. Ent. Soc., Washington, III, 46, ♀ ♂, 1894.

California: San Diego (Lucas), Poway (Patton). Patton's *P. hesperiæ* is identical with this species.

11. PEPSIS CERBERUS R. Luc.

Pepsis cerberus R. Lucas, l. c., 790, figs 101, 178, 225, ♂, 1895.

Mexico (Lucas); Texas.

12. PEPSIS LUCASII n. sp.

♀.—Blue, with a purplish reflection; antennæ black; wings orange, or reddish yellow, extreme base black, and margined with subfuscous, which color extends somewhat into the marginal cell and reaches to the venation; head broader than thorax; front strongly impressed; ocelli deeply pitted, the space between hind pair about equal to two-thirds of that between them and eyes; clypeus distinctly incurved; first joint of flagellum more than one-third longer than second; space between eyes at top about equal to combined length of the second, third, and one-third of the fourth antennal joints; pronotum subangulate behind; parapsidal grooves, long and deep, reaching almost the entire length of dorsulum; scutellum flat, obscurely keeled down middle; horizontal and posterior portions of middle segment separated, the median transverse fold prominent but not reaching sides, horizontal surface deeply channelled down the middle, with the rugæ irregularly transverse, feeblest in the lateral depressions, strong medially and above on sides, lateral teeth rudimen-

tary, no tubercle beneath stigma; mesosternal tubercle flat, indistinct; longer spur of hind tibiæ equal to about one-quarter of the length of first hind tarsal joint; abdomen ovate, apically clothed with long, black hairs, first segment rounded anteriorly, impression of second ventral strong, before middle. Length 23 mm.

Texas. One specimen. Distinguished by its small size, and by the wings not being heavily margined with black, the reddish yellow appearing to gradually coalesce with the subfuscous of apical portion of wings. In this respect it is allied to the tropical species, *P. lurida*, *periphetes* and *nigricans*. Dedicated to Herr Robert Lucas, whose skill and energy have produced a remarkable work, a monograph of the genus *Pepsis*, which will stand as a classic in entomological literature.

13. Pepsis inermis n. sp.

♀.—Blue, with purplish reflection; middle segment, abdomen in part, and antennæ black; wings brownish yellow, almost yellow, the base of anteriors as far as one-third of the median cell, extreme base of posteriors and a broad marginal band on both wings, fuscous, that of the superiors broadest and darkest and reaching the third transverso-discoidal vein, extending along the anterior portion of marginal cell and into the third submarginal; head fully as wide as thorax; front strongly impressed; ocelli scarcely pitted, the space between hind pair equal to somewhat more than half that between them and eyes; clypeus broadly and not deeply incurved; first joint of flagellum more than one-third longer than second; space between eyes at top about equal to the combined length of antennal joints 2, 3 and one-third of the fourth; pronotum angulate behind, subtruncate anteriorly; parapsidal grooves well marked, not reaching base of dorsulum; middle segment with the horizontal and posterior surfaces less distinctly marked than usual, through the small median, transverse fold (sometimes absent); horizontal surface broadly furrowed medially, the transverse rugæ irregularly transverse and extending well on to the sides, the usual longitudinal furrows or depression not distinct, posterior surface also transversely rugose, lateral teeth absent or rudimentary, no tubercle beneath stigma; mesopleural tubercle distinct; longer spur of hind tibiæ equal to about one-third the length of first hind tarsal joint; abdomen ovate, strongly and sparsely punctured. Length 27–30 mm.

Texas. Three specimens. Resembles small specimens of *P. marginata*, but is bluer, abdomen punctate, etc.

14. Pepsis Boguei n. sp.

♀.—Black, with dark blue and purplish reflection, the latter wanting on upper surface of thorax; antennæ brownish-black, the last joint orange at tip; wings almost yellow, black at base almost to middle

of the median cell, margins black, which beginning at apex of marginal cell and not quite reaching the venation; head fully as broad as thorax; ocelli rather deeply pitted, the space between the hind pair equal to somewhat more than half that between them and eyes; clypeus distinctly incurved; space between eyes at top a little greater than length of second joint of flagellum, this latter joint more than one-third longer than the second; pronotum subangulate behind, not much swollen anteriorly at the sides; parapsidal grooves distinct, not reaching base of dorsulum; upper and posterior surfaces of middle segment distinctly separated, the median transverse fold short and high, but rather broadly truncate above, upper surface of middle segment sulcate down the middle, the irregular transverse rugæ strongest medially and toward the sides, infrastigmal tubercle rather large, lateral teeth distinct; mesopleural tubercle distinct; longer spur of hind tibiæ equal to less than one-third the length of first hind tarsal joint; abdomen fusiform, impunctate, impression of second ventral segment curved, situated very near the middle. Length 34 mm.

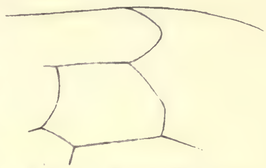

FIG. 13.—Third subm. cell, *P. Boguei*, ♀.

♂.—Colored like the ♀, the blue reflection perhaps stronger and present on thorax above; wings colored as in ♀, but subject to variation, the black in some specimens reaching the apex of median cell and beyond, and in most specimens is present in a lighter degree in the marginal, third submarginal and discoidal cells, the hind wings sometimes almost entirely dark, the yellow only showing as a small spot on the fore margin; clypeus angularly incurved; space between eyes at top distinctly greater than the length of second and third antennal joints; middle segment much as in female, with the lateral teeth larger; longer spur of hind tibiæ equal to about two-fifths of length of first hind tarsal joint; impression of second ventral segment indistinct, situated basally; fourth ventral with two heavy bunches of inwardly curling hairs, the fifth with an apical transverse brush of shorter, erect hairs, subgenital plate elongate, sides parallel, apex subtruncate, without hair, basally the plate is medially and longitudinally, but not always distinctly carinated. Length 22–32 mm.

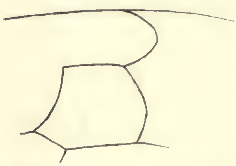

FIG. 14.—Third subm. cell, *P. Boguei*, ♂.

Texas; Colorado; Oklahoma Territory (E. E. Bogue). One ♀ and four ♂ specimens.

Although resembling several of the preceding species, yet *Boguei* is easily distinguished by its last antennal joint being orange at tip (a character apparently constant); it has, more-

over, good structural characteristics also, especially of the middle segment.

15. Pepsis cinnabarina R. Luc.

Pepsis cinnabarina R. Lucas, l. c., 804, ♀, 1895.

Mexico: Lower California; California: Coulterville (Lucas), San Diego. The wings in this species are fiery red.

—The following paper was read by Mr. Ashmead:

NOTES ON PARASITIC HYMENOPTERA, WITH DESCRIPTIONS OF SOME NEW SPECIES.

By Dr. George Dimmock, Springfield, Mass., and William H. Ashmead, Washington, D. C.

PART I.—NOTES ON PARASITIC HYMENOPTERA.

By Dr. George Dimmock.

The following notes concern parasitic hymenoptera, mostly reared species, for the identification of which I am indebted to Mr. W. H. Ashmead, whose article accompanying this paper will describe the species that proved to be new, and which are indicated by a * against the abbreviation Ashm.

The data which pertain to each species are fragmentary, as many of the parasites were the accidental results of attempting to rear their hosts. Dates of emergence, and locality, are of some importance, and are quite fully noted: the locality N. H., in all cases, signifies Canobie Lake, a village about five miles north of the state line of Massachusetts, between the towns of Windham and Salem, in Rockingham county, New Hampshire.

The numerals in parentheses refer to my manuscript notes, and correspond with numbers on the specimens preserved.

Family Proctotrypidæ.

(1) *Telenomus dimmocki*, *Ashm. One lot reared from eggs of a hemipteron (possibly *Podisus spinosus*), found 20 July, 1885, at Arlington, Mass.; parasites emerged 24 July. A second lot of the same kind of eggs, found in N. H., 10 July, 1892, gave parasites 14 July. (702, 958.)

(2) *Telenomus sphingis*, Ashm. From egg of *Telea polyphemus*, Belmont, Mass., 4 Aug., 1883. (536.)

(3) *Helorus paradoxus*, Prov. Reared from a chrysopid larva taken 20 July, 1885, in Arlington, Mass.; this larva pupated 28 July, and from the pupa the parasite emerged 20 Aug. (709.)

Family Cynipidæ.

(4) *Allotria ambrosiæ*, *Ashm. Reared from *Siphonophora ambrosiæ*, in Arlington, Mass. (781.)

Family Chalcididæ.

(5) *Chalcis ovata*, Say. From a larva, probably of *Zerene catenaria*. N. H. (1138 d.)

(6) *Perilampus cyaneus*, Brullé. One specimen from a tachinid pupa reared from a larva of *Spilosoma virginica*, in Cambridge, Mass. Numerous specimens, in latter half of Sept., from a breeding-cage of larvæ of *Zerene catenaria*, in N. H.; as these larvæ were badly parasitized by tachinids, it is likely that the chalcids were, in this case also, parasites of the tachinids. (674, 934.)

(7) *Encyrtus thyreodontis*, *Ashm. A larva of *Smerinthus excæcatus*, taken 8 Sept., 1882, in Cambridge, Mass., that went under ground for pupation 3 Oct., was dug up later, and found to be parasitized by *Thyreodon morio*. From the cocoon of the *Thyreodon* emerged, April, 1883, a large number of *E. Thyreodontis*, of which 170 specimens were preserved and many lost. On 6 Sept., 1882, a female *E. thyreodontis* was watched while apparently ovipositing in a larva of *S. excæcatus;* both larva and chalcid were preserved, and the former produced a healthy normal male imago, not producing chalcids, perhaps because it had not been parasitized previously by a *Thyreodon* to provide a suitable host. Another *E. thyreodontis* was observed stinging a larva of *Attacus cecropia;* this larva died later, possibly of some bacterial disease, but no chalcids came from it. Were the two presumably resultless ovipositions cases of mistaken instinct? (340, 345, 563.)

(8) *Homalotylus terminalis*, Say (= *Scelio terminalis* Say = *H. obscurus*, How. = *Eutelus scymnæ* Schimer). Bred several times, in August, 1885, from larvæ of *Coccinella novemnotata*, taken in Arlington, Mass. Synonymy by Mr. Ashmead. (731 c.)

(9) *Pteromalus puparum*, L. From pupa of *Pieris rapæ*, Aug., 1895, in N. H. (1124.)

(10) *Pteromalus tabacum*, Fitch. Found a dead larva of *Smerinthus geminatus*, covered with cocoons of an *Apanteles*, 29 Aug., 1892; the *Smerinthus* had been parasitized also by a tachinid, and its half-starved larvæ appeared the next day, only two of them with sufficient vitality to pupate; these two never producing imagos. A very large number of chalcid imagos emerged. *P. tabacum* was also reared, Aug., 1895, from a

larva of *Ampelophaga myron.* Both rearings were in N. H (1020 q, 1123.)

(11) *Habrocytus phycidis*, *Ashm. Bred from larva of *Phycis rubrifasciella;* parasite emerged 25 July, 1892. N. H. (961 c.)

(12) *Diglochis omnivorus*, Walk. This introduced European species was reared from a pupa of *Orgyia leucostigma*, in Cambridge, Mass., in 1883. (509 c.)

(13) *Elachistus cacœciæ*, How. Bred from *Cœlodasys unicornis;* the parasites, which fed internally, came out and pupated 7 July, and two only (♂ and ♀) emerged 11 August. Cambridge, Mass., 1883. (489.)

(14) *Elachistus cidariæ*, *Ashm. Bred from larva of *Cidaria diversilineata*, in N. H. (580.)

(15) *Entedon albitarsis*, Ashm. Hyperparasitic on *Apanteles congregatus* from *Thyreus abbotii.* Cambridge, Mass., July, 1882. (125.)

(16) *Cratotechus brevicapitatus*, C. & D. Bred from larvæ of *Euplexia lucipara*, which are quite common in gardens in Cambridge, Mass., feeding on *Dicentra spectabilis.* One lot of 20 pupæ of *C. brevicapitatus*, found 27 July, 1882, emerged 1 Aug., 1882; another lot pupated 14 Sept., 1882, and emerged 7 May, 1883, thus hibernating as pupæ. Another lot was bred from a geometrid larva that fed on *Prunus nana;* pupation occurred 15 June, 1884, and emergence 28 June, 1884. (134, 347, 601.)

(17) *Cratotechus smerinthi*, *Ashm. From larva of *Smerinthus excæcatus*, found in N. H. Pupation of the chalcid larvæ about 16 Sept., 1892; emergence, the next spring, before 30 May. (1064.)

(18) *Eulophus incongruus*, *Ashm. Hyperparasitic on *Apanteles congregatus* reared from larva of *Thyreus abbotii.* Cambridge, Mass., July, 1882. (125.)

(19) *Tetrastichodes tibialis*, Ashm. Hyperparasitic (on *Homalotylus?*) in pupæ of *Coccinella novemnotata*, in Cambridge, Mass. Thirteen specimens emerged from one coccinellid pupa, 31 Aug., 1885; fifteen from another pupa, 2 Sept., 1885. (734, 738.)

Family Braconidæ.

(20) *Rhogas intermedius*, Cr. Emerged 20 Sept., 1882, from a cocoon of *Ennomos alniaria*, in Cambridge, Mass. Also reared from a larva of *Apatela hastulifera*, taken at Wachusett, Mass., 26 Aug., 1882. (266, 1138 e.)

(21) *Rhogas geometræ*, Ashm. Bred from a geometrid larva (probably *Anisopteryx*) from Arlington, Mass.; parasite pupated 20 June, 1884, and emerged 8 April, 1885. (612.)

(22) *Bracon charus*, Riley. Known to be a parasite of buprestid and cerambycid larvæ, this species was bred from decaying bark of *Quercus*, where its host was apparently *Eucrada humeralis*. Cambridge, Mass., 1885. (671.)

(23) *Habrobracon gelechiæ*, Ashm. From a noctuid larva living among the buds and blossoms of *Solidago;* Cambridge, Mass., July, 1883. (429.)

(24) *Apanteles acronyctæ*, Riley. From a larva of *Apatela*, supposed to be that of *A. vulpina*, in N. H., Sept., 1892. (1032.)

(25) *Apanteles congregatus*, Say. I have obtained this species from the following sphingid larvæ: *Thyreus abbotii*, at Cambridge, Mass., about 1 July, 1879, and about 26 July, 1882; at the latter date the *A. congregatus* had four kinds of hyperparasites, which are mentioned under their respective species. *Philampelus pandorus*, at Cambridge; the parasites emerged about 1 Oct., 1882. *Ampelophaga myron*, at Cambridge; the parasites emerging 19 Aug., 1882; also, several rearings in N. H., among which emergences occurred 12 Aug., 1890, and about 1 Sept., 1892. *Ampelophaga versicolor*, in N. H.; emergences 16 and 25 Aug., 1892. *Sphinx chersis* (= *S. cinerea*), at Cambridge; emergences, 17 Sept., 1882, 4 Aug., 1883, and 21 May, 1884. The last mentioned lot of parasites hibernated as pupæ, having pupated 11 Sept., 1883. *Dolba hylæus*,* in N. H.; emergence early in Sept., 1895.

(26) *Apanteles smerinthi*, Riley. From larvæ of *Smerinthus geminatus*, in N. H.; in some cases the parasites hibernate in their cocoons. (1020, 1136.)

(27) *Apanteles xylina*, Say. From larva of *Ellema harrisii*, in N. H.; parasites pupated late in August and emerged early in Sept., 1895. (1121.)

(28) *Apanteles euchætis*, *Ashm. From larvæ of *Euchætes egle*, in N. H. The larvæ of the parasite came from the moth-larva, and pupated in a mass beneath the hairs of the latter; both pupation and emergence occurred in Aug., 1895. (1125.)

(29) *Apanteles murtfeldtæ*, Ashm. From a geometrid larva that fed on *Rubus canadensis*, at Cambridge, Mass.; parasites pupated 2 July, 1883, and emerged five days later. (450.)

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* These parasites were from the larva of *D. hylæus* [!], which feeds on *Ilex verticillata*, and not from the larva well described by Mr. S. H. Scudder (Psyche, 1877, v. 2, p. 77), which I have proved by rearing to be that of *Sphinx gordius*, which is common on *Comptonia asplenifolia* in N. H., and which I have found in Cambridge, Mass., feeding on *Spiræa salicifolia*.

(30) *Apanteles nemoriæ*, *Ashm. Bred from larvæ of a *Nemoria* (probably *N. gratata*) which fed on *Euphorbia corollata*, in Suffield, Ct., Aug., 1883. Several specimens also from larvæ of *Eucrostis chloroleucaria;* parasites pupated 21 July, 1892, and emerged 26 July, 1892. Larvæ of *E. chloroleucaria* are common in N. H., feeding upon the flowers of *Rudbeckia hirta* and of species of *Aster*, and, in 1892, more than half the larvæ were parasitized by *A. nemoriæ*. (565, 962.)

(31) *Apanteles parorgyiæ*, Ashm. From larva of *Pyrrharctia isabella;* parasites pupated in a mass of cocoons 5 Aug., 1892, and emerged 12 Aug., 1892. (1012.)

(32) *Apanteles schizuræ*, *Ashm. Bred from larvæ of *Cœlodasys unicornis*, in N. H.; parasites pupated 6 July, 1892, and emerged about eight days later. (943.)

(33) *Apanteles radiatus*, *Ashm. From a lepidopterous larva feeding on *Plantago major*, in Cambridge, Mass. (1129.)

(34) *Pseudapanteles ephyræ*, *Ashm. From larvæ of *Ephyra pendulinaria*, in N. H.; one parasite pupated 16 July, 1892, and emerged 22 July, 1892; another emerged 5 Aug., 1892. In each case but a single *Pseudapanteles* came from a larva of the geometrid, and both the green and brown forms of these variably colored larvæ were parasitized. (944 c, 960 a.)

(35) *Protopanteles tortricis*, *Ashm. From a tortricid larva that feeds on *Comptonia asplenifolia*, in N. H.; emergence 13 July, 1892. (949.)

(36) *Microplitis hyphantriæ*, Ashm. From an undetermined bombycid larva that fed on apple leaves, in Cambridge, Mass.; parasite emerged about 10 July, 1883. (486.

(37) *Microdus simillimus*, Cr. Bred from larva of *Pædisca strenuana*, which mines the pith of *Ambrosia artemisiæfolia*. Arlington, Mass.; parasite emerged 21 Aug., 1885. Also bred, in N. H., from *Phycis rubrifasciella;* parasite pupated 18 July, 1892, and emerged 28 July, 1892. (730 g, 979.)

(38) *Macrocentrus delicatus*, Cr. Parasite of *Pædisca strenuana;* emerged about 24 Oct., 1885. Arlington, Mass. (930 e.)

(39) *Amicoplus crambi*, Ashm. From a larva, probably tortricid, that wraps up the leaves at tip of twigs of *Prunus nana*. Cambridge, Mass.; parasites emerged 30 June, 1884. (602.)

(40) *Aphidius nigriceps*, Ashm. From *Siphonophora ambrosiæ*, at Arlington, Mass., 1885. (781 a.)

(41) *Aphidius ribis*, Ashm. From *Myzus ribis*, at Cambridge, Mass., May–June, 1884. (589 a.)

FAMILY ICHNEUMONIDÆ.

(42) *Anomalon exile*, Prov. A male emerged from a pupa of *Phycis rubrifasciella*, 12 Aug., 1892, in N. H. (961 p.)

(43) *Thyreodon morio*, Fabr. Often reared from *Smerinthus excæcatus*, both in Cambridge, Mass., and in N. H. Hibernates as pupa. (361, 1031.)

(44) *Ophion bifoveolatus*, Brullé. From pupa of an undetermined arctian found in N. H., in 1891; parasite emerged 28 July, 1892. (978.)

(45) *Enicospilus purgatus*, Say. Bred from a pupa of *Prionia bilineata*, in N. H.; the bombycid pupated 6 Oct., 1893, and the ichneumon emerged 17 April, 1894. (1069 c.)

(46) *Campoplex diversus*, Nort. From *Cidaria diversilineata*, in Cambridge, Mass.; emergence of parasite 23 Aug., 1882. Also found in N. H. (1008 e.)

(47) *Hypotherentes geometræ*, *Ashm. From an undertermined geometrid larva, on *Betula alba*, at Arlington, Mass.; parasite pupated 17 June, and emerged 27 June, 1884. (611.)

(48) *Limneria fugitiva*, Say. Three specimens from larvæ of *Œdemasia concinna*, Belmont, Mass.; parasites emerged 11 Sept., 1882. Also two specimens from Springfield, Mass. (326.)

(49) *Ischnoscopus synchloræ*, *Ashm. Reared from larva of *Aplodes* (possibly *A. mimosaria*) in N. H.; pupation 14 July, 1892; emergence, 21 July, 1892. (956 a.)

(50) *Mesochorus tachinæ*, *Ashm. Hyperparasitic: from a tachinid puparium, the tachinid larva being parasitic on a tortricid larva that fed on *Comptonia asplenifolia*, in N. H.; emergence of the ichneumon 11 Aug., 1892. (992 j.)

(51) *Mesochorus aprilinus*, Ashm. Hyperparasitic on *Apanteles congregatus* (from larva of *Ampelophaga versicolor*) and on *Apanteles smerinthi* (from larva of *Smerinthus geminatus*); emergence of the ichneumons early in Oct., 1895, in N. H. The above-mentioned larva of *A. versicolor* was also host of two tachinid larvæ, thus illustrating both hyperparasitism and double parasitism. (1013, 1127.)

(52) *Trypon subcrassus*, Cr. A single male from the pupa of an undertermined tenthredinid larva taken 26 Aug., 1882, on *Prunus pennsylvanicus*, at Wachusett, Mass.; emergence of parasite 27 May, 1883. (270.)

(53) *Neoeryma lophyri*, *Ashm. Reared by Miss Anna Dimmock, from larvæ of *Lophyrus abbotii*, in N. H.; emergences, 1, 2, 5, 7 and 16 June, 1893. (1058.)

(54) *Sychnoportus rufopectus*, *Ashm. From a tenthredinid larva that fed on *Populus tremuloides*, in N. H. (1131.)

(55) *Trogus exesorius*, Brullé. From hibernated pupæ of

Papilio asterias, in 1892. A very large dark-winged specimen from *P. troilus*, in 1895. N. H. (941, 1138 a.)

(56) *Ichneumon maius*, Cr. Taken hibernating in large numbers, under bark, in N. H., 18 Mar., 1894. (1110.)

(57) *Phæogenes phycidis*, *Ashm. Reared from *Phycis rubrifasciella*, in N. H.; emergence of parasite, 28 July, 1892. (961 k.)

(58) *Phæogenes mellinus*, Prov. From pupa of *Oxyptilus periscelidactylus*, in Cambridge, Mass. (684.)

(59) *Acrobela tachinæ*, *Ashm. From a tachinid puparium reared from an undetermined geometrid larva which is abundant on *Ambrosia artemisiæfolia* about Cambridge, Mass. (567.)

(60) *Hemiteles annulatus*, Ashm.

(61) *Hemiteles utilis*, Nort. Both species raised, as hyperparasites, from the same larva of *Thyreus abbotii* that produced the chalcids *Eulophus incongruus* and *Entedon albitarsis*. Cambridge, Mass., July, 1882. (125 a.)

(62) *Cryptus pallidus*, Cr. A male, probably of this species, was reared from *Oxyptilus periscelidactylus*, in Cambridge, Mass. (684 b.)

(63) *Cryptus extrematis*, Cr. From pupa of *Attacus promethea*, in N. H. (996.)

(64) *Pimpla conquisitor*, Say. Reared in considerable number from pupæ of *Zerene catenaria*, in N. H.; the parasites mostly emerged about 20 Aug., 1892, from pupæ collected six days earlier. Four specimens, the same year, from *Phycis rubrifasciella*, in N. H.; emergences 23, 26, 29 and 31 July. A specimen of *P. conquisitor* was taken 21 July, 1884, in Cambridge, Mass., while ovipositing in a larva of *Orgyia leucostigma* that had already spun its cocoon for pupation. (639, 934, 961.)

(65) *Pimpla indagatrix*, Walsh. From a tortricid larva that rolls up the ends of leaves of *Comptonia asplenifolia*, in N. H.; emergence of parasite 20 July, 1892. Another bred from a larva, probably a pyralid, that feeds on *Betula alba*, in N. H. (949 c, 1114 a.)

(66) *Pimpla novita*, Cr. Raised twelve specimens from larvæ of *Mononychus vulpeculus*, which fed in the unripe seed-pods of *Iris versicolor;* from the same lot of seed-pods only two *M. vulpeculus* emerged, showing how extensive the parasitism was. Raised three specimens from larvæ of *Phycis rubrifasciella;* emergences 20, 22 and 31 July, 1892. Both rearings in N. H. (918, 961 a.)

(67) *Pimpla rufovariata*, Cr. Bred from its pupa found at Arlington, Mass., 10 Aug, 1885, in a mine of *Pædisca*

#2

strenuana in *Ambrosia artemisæfolia*, where it had replaced its host; emerged 15 Aug., 1885. (730.)

(68) *Pimpla inquisitor*, Say. Emerged, 27 June, 1883, from a lepidopterous (probably geometrid) pupa found ten days earlier on *Prunus pennsylvanicus*, in Cambridge, Mass. (412.)

(69) *Asphragis pulcherrimus*, *Ashm. From a tortricid larva feeding on *Comptonia asplenifolia*, in N. H.; emergence of parasite, 3 Aug., 1892. (992 b.)

(70) *Bythycetes scutellaris*, Cr. From *Ægeria tipuliformis*, L.; Cambridge, Mass. (678 e.)

3-21-1898

PART 2.—DESCRIPTIONS OF NEW PARASITIC HYMENOPTERA.

By William H. Ashmead.

The new species of parasitic Hymenoptera described below were all bred by Dr. Dimmock, and the numbers prefixed to the species conform to those of Dr. Dimmock's in part 1 of this article, where the records in regard to breeding, hosts, &c., may be found.

Family Proctotrypidæ.

(1) **Telenomus dimmocki**, n. sp.

♀.—Length 1–1.1 mm. Black, shining; mesonotum microscopically punctate, sericeous; scutellum polished, impunctate; antennæ black, the scape pale at extreme base, pedicel yellow at tip; legs brownish-yellow, the coxæ black, the femora, except at tips, fuscous or dark brown.

Head transverse, about 2½ times as wide as thick antero-posteriorly. Mandibles yellowish. Antennæ 11-jointed, the pedicel a little shorter than the first joint of funicle, the latter about 2½ times as long as thick at tip; second funiclar joint two-thirds the length of first, the third very little longer than thick, the fourth moniliform; club 5-jointed, the first about twice as wide as the last joint of funicle, the second, third and fourth still wider, and all wider than long, the second being the longest joint, the fifth conical. Wings hyaline, ciliate, the nervures brownish-yellow; the marginal vein is about two-thirds the length of the stigmal.

Abdomen as long as the thorax, truncate or subtruncate at tip, and, except the petiole and the suture at base of second segment, entirely smooth and highly polished; petiole and first suture striated; the second segment is about 1½ times as long as wide at apex.

♂.—Length about 8 mm. Black; scape and legs yellow; the coxæ more or less dusky basally; flagellum light brown. Antennæ 12-jointed, scarcely

as long as the body; the first and second joints of the flagellum are elongate, about of an equal length, three times as long as thick; the third joint is only about half the length of the second, slightly curved; the following joints, except the last, are small, rounded or moniliform, and loosely united, while the last joint is conical, twice as long as the preceding.

Hab.—Canobie Lake, N. H. (Bred from Hemipterous eggs.)

FAMILY CYNIPIDÆ.

(4) **Allotria ambrosiæ**, n. sp.

♀.—Length 1.6 mm. Polished black; mandibles, first five joints of antennæ and the legs, pale yellowish; pronotum, scutellum towards apex and metapleura rather densely pubescent; the basal scutellar furrow slightly separated into two parts by a very delicate median carina; metathorax very short, with about six elevated lines. Abdomen with a pubescent ridge on each side at base. Flagellum with joints 1 and 2 subequal, not longer than the scape, the third joint stouter than the two preceding and somewhat longer, the following three or four joints subequal.

Hab.—Cambridge, Mass. (Bred from an Aphis on Ambrosia.)

FAMILY CHALCIDIDÆ.

(7) **Encyrtus thyreodontis**, n. sp.

♀.—Length 1.6 to 1.8 mm. Head bluish; thorax above æneous black, at the sides and beneath, blue-black; abdomen and legs black; sutures of the trochanters, knees, tips of all tibiæ and tarsi, except the last joint, honey-yellow; antennæ black; wings hyaline, the marginal and stigmal veins brown, the latter scarcely longer than the marginal, the post-marginal vein short; mandibles reddish, tridentate.

Head with the frons and vertex microscopically shagreened, opaque; eyes large, oval, the frontal space rather narrow, about half the width of the eye, the lateral ocelli close to the eye margin, the front ocellus farther away from the lateral ocelli than these last are to each other. Antennæ 11-jointed, the club much stouter than the last joint of funicle, half as long as the scape and obliquely truncate at apex from beneath; pedicel obconical, as long as joints 1-3 of funicle united; funicle 6-jointed, the first joint a little longer than thick, the following transverse, gradually widening, the three last being more than twice wider than long.

Pro- and meso-notum smooth, polished, impunctate; scutellum, including the axillæ, minutely shagreened with a few long hairs; metathorax very short, smooth, the pleura bright cupreous, with white fimbria, the spiracles round. Abdomen as long as the thorax, depressed, acute at tip, with the sheaths of ovipositor somewhat prominent.

Hab.—Cambridge, Mass. (Bred from *Thyreodon morio*, Fabr.)

(11) **Habrocytus phycidis**, n. sp.

♀.—Length 3 mm. Head and thorax bronzed-green, confluently punctate; scape, tegulæ, tips of femora and all tibiæ and tarsi, except the last joint, honey-yellow; abdomen conically produced, blue, with æneous tingings; wings hyaline, the veins light brown.

Head about $3\frac{1}{2}$ times as wide as thick antero-posteriorly, the frons slightly impressed; ocelli subtriangularly arranged, red; mandibles rufous, the right 3-dentate; flagellum brown-black, pubescent, very slightly thickened towards tip, the first joint a little less than three times as long as thick, longer than the second, the second about twice as long as the pedicel, the third and following joints very gradually, almost imperceptibly shortening. Pronotum not short, as long at the middle as at the angles, the anterior edge rounded, not acute or margined; mesonotum about one-half wider at base than long at the middle, with the parapsidal furrows distinct anteriorly and extending back as far as the middle of the mesonotum; axillæ as far from each other as their width at base; scutellum proper, with the transverse suture before tip nearly obsolete; metathorax not short, produced at apex into a subglobose neck, closely punctate, the lateral folds distinct at base, the median carina only vaguely defined at base, the spiracles large, oblong-oval. Front wings with the marginal and postmarginal veins equal in length, or nearly so, while the stigmal vein, with its small knob, is about four-fifths the length of the marginal. Abdomen conically produced, flattened above, boat-shaped beneath, and about $1\frac{1}{2}$ times as long as the head and thorax united, the second segment, with a large deep fovea at base, (just beneath the neck of the metathorax, and not quite as long as segments 3–5 united,) segment 3, except the short petiole, the shortest segment, the following segments gradually increasing in length, the last conical; segments 4–8, under a very high power lens, exhibit delicate, wavy, microscopic lines.

Hab.—Canobie Lake, N. H. (Bred from larva of *Phycis rubrifasciella*.)

(14) **Elachistus cidariæ**, n. sp.

♀.—Length 1.8 mm. Black, shining, but with the pronotum, mesonotum, and scutellum microscopically reticulate. Head polished, the frons concave; metanotum polished, with a median carina and broad lateral sulci; antennæ light brown, or brownish-yellow, if darker above, paler beneath, the scape paler; legs, except coxæ and femora, pale yellowish, coxæ black, the femora, except tips, embrowned, the hind femora almost black. Wings hyaline, the veins pale; the marginal vein is fully as long as the subcostal vein, or more than three times as long as the stigmal; the postmarginal twice as long as the stigmal. Abdomen depressed, rotund, much shorter, but a little wider than the thorax, æneous-black, with the second dorsal segment (the first after the petiole) mostly pale.

Hab.—Cambridge, Mass. (Bred from larva of *Cidaria diversilineata*.)

(17) **Cratotechus smerinthi**, n. sp.

♀.—Length 2.5 mm. Head, mesopleura and abdomen cupreous; thorax blue-green, the pronotum above blue; scape, tegulæ and legs, except the hind coxæ, waxy-white: flagellum brown, paler beneath. Wings hyaline, the marginal, stigmal and postmarginal veins light brown.

♂.—Length 2 mm. More uniformly bluish-green, the depressed frons alone bright cupreous; abdomen æneous-black; first, second and third joints of flagellum with a long branch; otherwise, except that the middle coxæ are metallic at base, it agrees with the female.

Hab.—Canobie Lake, N. H. (Bred from larva of *Smerinthus excæcatus.*)

(18) **Eulophus incongruus**, n. sp.

♀.—Length 1.5 to 1.8 mm. Æneous-black, scaly punctate, with purplish metallic reflections in certain lights; scape, flagellum beneath, trochanters, tips of femora, and all tibiæ and tarsi, except the last joint, yellowish-white. Wings hyaline, the veins light brown, the marginal vein more than three times as long as the stigmal, the postmarginal nearly twice as long as the stigmal.

Head transverse, wider than the thorax, with a deep, broad frontal excavation, clothed with sparse, short hairs; viewed from in front the head is wider than long, the space between the eyes alone being as wide as the head is long; the anterior ocellus is on or at the extreme edge of the frontal excavation: antennæ 8-jointed, inserted below the middle of the face, on an imaginary line drawn from the base of the eyes; the scape is a little longer than half the length of the flagellum, including the pedicel, and does not quite reach to the front ocellus; flagellum slightly thickened towards the tip, the pedicel a little shorter than the first joint of the flagellum; joints 2-4 of funicle about equal in length but widening, joints 3 and 4 being a little wider than long; club cone-shaped, 2-jointed.

Thorax clothed with long, sparse hairs; no parapsidal furrows, the mesonotum slightly depressed in front of the scutellum; scutellum rather large, subconvex, the axillæ widely separated, each bearing a long black bristle at inner apical angle; metathorax not short, with a median carina and broad spiracular sulci, the spiracles rounded. Abdomen oval, depressed, not longer than the thorax, the segments subequal.

♂.—Length 1.2 mm. Agrees well with the female, except in its smaller size and in having joints 1 to 3 of flagellum furnished with a long pilose branch.

Hab.—Cambridge, Mass. (Bred from the larva of *Thyreus abbotii.*)

The species is undoubtedly a hyperparasite on one of the primary parasites reared by Dr. Dimmock from this moth. It is placed in the genus *Eulophus* only temporarily.

Family Braconidæ.

(28) **Apanteles euchætis,** n. sp.

♂ ♀.—Length 2–2.5 mm. Black, shining; scape beneath in ♂, pedicel, and two or three of the basal joints of flagellum testaceous (scape in ♀ black); palpi white; legs honey-yellow, the hind coxæ, except at tips and beneath, black, polished, impunctate, their femora fuscous, paler towards base and beneath, tips of their tibiæ and tarsi, subfuscous.

Head on vertex and behind polished, impunctate, the face opaque, confluently punctate; mandibles rufous; antennæ in ♀ about the length of the body, in ♂ a little longer. Mesonotum finely but not closely punctate, shining, the punctures confined to anterior margin and at basal angles of the humeri, the scutellum shining but distinctly although sparsely punctate; metanotum rather short, shining, only slightly wrinkled, the median carina very delicate and almost obliterated. Wings hyaline, the stigma pale brownish, the nervures pallid; the first abscissa of radius is scarcely as long as the transverse cubitus, or at least not longer. Abdomen, except the lateral membranous margins of first dorsal segment and ventral segments 1 and 2 which are reddish-yellow, polished black, shining; the plate of first segment is long, trapezoidal, from 2½ to 3 times as long as wide at apex, with the hind angles slightly rounded, smooth or at the most with only a few sparse punctures; the second segment has distinct oblique lateral furrows and in the ♀ is a little more than one-third the length of the third, while in the ♂ it is scarcely one-third the length of the third; the fourth segment in ♀ is two-thirds the length of third, the following a little shorter; in the ♂ the fourth segment is only about half the length of the third.

Hab.—Canobie Lake, N. H. (Bred from larva of *Euchætes egle.*)

(29) **Apanteles murtfeldtæ,** n. sp.

♀.—Length 1.8 mm. Black, shining, sericeous; scape, pedicel and legs, except hind coxæ which are black and punctate, brownish-yellow, the tips of hind tibiæ and tarsi subfuscous; flagellum brown-black, fluted; lateral membranous margins of dorsal segments 1 to 3 and sides of ventral segments 1 to 5 (the latter only slightly so) yellowish; mandibles, except at tips, ferruginous or reddish; palpi and tegulæ yellowish-white.

Head above smooth, shining, impunctate, the temples feebly alutaceous; face shagreened, subopaque; antennæ about as long as the body. Mesonotum closely, uniformly punctate, subopaque; scutellum polished, shining, feebly sparsely punctate at sides only; metathorax not short, finely rugose, with a distinct median carina; mesopleura smooth, polished on the disk, with a femoral furrow, but anteriorly, and along the upper margin, punctate. Wings hyaline, the stigma, poststigmal vein and first branch of the radius light brown, the other veins pallid; first abscissa of radius a little longer than the transverse cubitus or the upper side of the

open areolet. Abdomen as long as the thorax; the plate of first segment is trapezoidal, about 1½ times as long as wide at apex, with the hind angles a little rounded; the plate and the second segment, and the third segment, except at apex, but more feebly so, rugoso-punctate, the second with a median ridge, rest of the abdomen smooth and shining; the second segment is a little shorter than the third or at least not longer, while the fourth and fifth united are scarcely as long as the third.

♂.—Length 1.6 mm. Differs from ♀ in having the antennæ longer than the body, the scape brownish only beneath, the hind coxæ pale at apex, the hind femora at tips as well as the tips of their tibiæ and their tarsi, fuscous; while the abdomen is depressed, with the plate of first segment a little narrower in proportion to its width, it being fully 1¾ times as long as wide at apex.

Hab.—Cambridge, Mass., and Kirkwood, Mo. (Miss Mary Murtfeldt.)

This species was first bred by Miss Murtfeldt, and is now in the U. S. National Museum, labeled "from a gray Geometrid on Oak, Aug. 12, 1886." It has also been bred by Dr. Dimmock from an unknown Geometrid feeding on *Rubus*.

(30) **Apanteles nemoriæ**, n. sp.

♂ ♀.—Length 1.8 to 2 mm. Black, sericeous; palpi whitish; mandibles and legs ferruginous; all coxæ black; terminal joints of anterior and middle tarsi, middle femora toward base, hind femora above, apical one-third of their tibiæ and their tarsi, fuscous or black; hind femora beneath, more or less rufous; tibial spurs white.

Head shining, the face subconvex, with a slight median carina above, and minutely, closely punctate; ocelli whitish; antennæ nearly as long as the body, black, the scape at extreme apical margin piceous.

Thorax above, including the scutellum, minutely, closely punctate, opaque, and finely sericeous; mesopleura punctate anteriorly, the punctures becoming less dense posteriorly, where there is a smooth, polished median space; metathorax moderately rugulose, with a delicate median carina. Wings hyaline, the tegulæ and stigma brown, the costal nervure, parastigma and internal nervures pale or hyaline; first abscissa of the radius 1½ times as long as the transverse cubital nervure, or the inner side of the open triangular areolet; third abscissa of the median nervure a little longer than the second; discoidal and subdiscoidal veins subobsolete. Abdomen not longer than the thorax, wholly black, except the coxal foveæ which are piceous, and the lateral membranous margins of the first segment which are honey-yellow; the plate of first segment is trapezoidal, about 1½ times as long as wide at apex, the plate and second segment rugulosely punctate, the latter with a slight median ridge, and very little shorter than the third segment; the third segment, except narrowly at outer basal angles, as well as all the following segments, is smooth, impunctate; ovipositor at the most subexserted.

Hab.—Suffield, Mass., and Canobie Lake, N. H. (Bred from larva of *Nemoria gratasia*.)

This species comes nearest to *A. limenitidis* Riley, and might easily be confused with it; but the paler trochanters, color of anterior legs, pale costal and internal nervures, the sculpture of the first and second abdominal segments which is coarser, while the second segment is proportionately longer, readily separate the two species.

(31) **Apanteles parorgyiæ**, sp. n.

♀.—Length 25 mm. Black; palpi, tegulæ, costal nervures toward base and median and submedian nervures, white; scape, except apex, pedicel, mandibiles, except tips, legs including coxæ, abdomen beneath, lateral margins of all dorsal segments, the third dorsal segment entirely (rarely with a dusky spot at middle) and large lateral spots on fourth and usually small lateral spots on fifth segment, yellow. Sometimes the third dorsal segment except two small lateral spots, as well as the following segments, are wholly black.

Head smooth, polished; the face sparsely minutely punctate but still shining, with a slight median carina above, more distinct in male.

Thorax above closely confluently punctate, opaque, sericeous, except a small space on the shoulders where the punctures are separated and the scutellum; mesopleura with a large shining impunctate space on disk but anteriorly and extending on to the mesosternum the surface becomes rather closely punctate; metespisternum smooth, polished, with a large fovea; metapleura and metanotum rather coarsely rugose, the latter with a sharp well-defined median carina; hind coxæ sometimes dusky at base.

Wings hyaline; costal nervure towards apex, parastigma, stigma and other nervures except as already mentioned light brown; first abscissa of radius a little shorter than the first transverse cubital nervure.

Abdomen a little longer than the thorax; plate of first segment trapezoidal; it, as well as the second segment, longitudinally lineately rugose; the third more or less feebly sculptured at base; the following segments smooth, polished, the second segment is a little shorter than the third, the fourth about half as long as the third.

♂.—Length 1.5 mm. Besides the great difference in size, this sex differs greatly in other respects. The antennæ are very much longer than the body, the flagellum being brownish, with each joint indistinctly divided into two joints; the mesosternum and mesopleura anteriorly are more sparsely punctate; the metathorax is without the distinct median carina; the plate of first abdominal segment is rugoso-punctate, while the second segment is shallowly vaguely punctate or almost smooth; otherwise in color and venation of front wings, it agrees with the female.

Hab.—Canobie Lake, N. H.

Described from ♂ ♀ specimens bred by Dr. Geo. Dimmock, from larva of *Spilosoma* (?) *virginica*. Bred specimens are also in the National Museum reared from *Parorgyia clintonia*.

(32) **Apanteles schizuræ, n. sp.**

♂ ♀.—Length 1.8 to 2 mm. Head and thorax black, sericeous; labrum and mandibles ferruginous; palpi and tegulæ white; legs brownish-yellow, the anterior pair a little the paler; hind coxæ black, tips of hind femora, tips of their tibiæ and their tarsi fuscous.

Head above and behind polished, impunctate, face feebly microscopically punctate; antennæ a little longer than the body, brown-black. Thorax at sides and beneath, shining; the mesonotum opaque, minutely, densely punctate; scutellum shining, sparsely punctate; mesopleura anteriorly closely punctate, on disk and posteriorly smooth, shining; metathorax finely rugulose, subopaque, with a distinct median carina; wings hyaline, with the stigma and poststigmal vein brown, the other nervures paler; there is a bulla at the inner fork of the areolet, and the upper fork of the areolet is two-thirds the length of the first abscissa of radius. Abdomen not quite as long as the head and thorax united, black, except the lateral membranous margins of the first segment and the sides of venter at base, usually hidden by the hind coxæ, which are piceous or reddish; the first and second segments are finely rugulose, the second less distinctly so, or much more finely sculptured, with a very slight indication of a median ridge at base; the plate of the first segment is trapezoidal, scarcely 1½ times as long as wide, while the second segment is a little shorter than the third, the fourth is about half the length of the third, the following very slightly and gradually shorter.

The male differs in no particular from the female, except the antennæ are longer, being 1½ times as long as the body, ferruginous beneath; while the abdomen is much narrower, with the ridge on the second dorsal segment complete.

Hab.—Canobie Lake, N. H.

Described from many specimens bred by Dr. Geo. Dimmock, from larva of *Schizura unicornis;* also, from many specimens in U. S. National Museum, bred from same larva.

The species structurally comes nearest to *A. scitulus* Riley, but differs decidedly in colorational detail and in sculpture.

(33) **Apanteles radiatus, n. sp.**

♂ ♀.—Length 1.8–2 mm. Black, shining; scape, pedicel, legs, including the coxæ, the lateral membranous margins of dorsal segments 1–3, and the venter, except sometimes at the apex, brownish-yellow; tips of hind tibiæ dusky; flagellum dark brown, paler beneath, especially in the ♂; labium and mandibles reddish or ferruginous; palpi and tegulæ, white. Head above and posteriorly smooth, impunctate; the face feebly and sparsely, microscopically punctate, more distinctly punctate in ♀. Thorax polished, the mesonotum sparsely, minutely punctate, the mesopleura and scutellum impunctate, the former with a deep femoral furrow; metathorax not short, subopaque, feebly or finely rugulose, with a

distinct median carina. Wings hyaline, the stigma brown, the first abscissa of radius shorter than the transverse cubital nervure, or the upper side of the areolet. Hind coxæ long, cylindrical, extending to the apex of the third abdominal segment. Abdomen about as long as the thorax; the plate of first segment is narrow, in outline conical, about three times as long as wide at base; the plate and the second dorsal segment are longitudinally aciculate or striate, the latter being shorter than the third segment and with two oblique furrows, sometimes almost obliterated by the striæ.

Hab.—Canobie Lake, N. H. (Bred from a Lepidopterous larva feeding on *Plantago major*.)

(34) **Protapanteles ephyræ**, n. sp.

♂.—Length 2 mm. Black, pubescent, the head and thorax somewhat closely finely punctate, subopaque; palpi yellowish-white; legs except coxæ and tips of hind femora, tips of tibiæ and their tarsi except annulus at base of first joint, brownish-yellow; lateral membranous margins of first segment, and basal half of venter, yellow; the costa, stigma, and poststigmal vein dark brown, rest of veins subhyaline. The antennæ are much longer than the body, thickened at base and gradually becoming slenderer towards apex, the first flagellar the shortest and stoutest, three times as long as thick, the second four times as long as thick, the follow ing relatively longer and slenderer; mandibles ferruginous. Metathorax finely rugulose, shining, without carina; hind coxæ elongate, polished except a few microscopic punctures on the outer ridge towards base.

Wings hyaline, the recurrent nervure and second branch of the median nervure of an equal length, first abscissa of radius about one and two-third times as long as the transverse cubital nervure (the inner side of the areolet); hind wings with a closed discoidal cell and two margina cells defined by subobsolete hyaline nervures. Abdomen shorter than the thorax, the plate of first segment long trapezoidal more than twice as long as wide, with the hind angles slightly rounded, the surface, especially in apical third, delicately sculptured with oblong punctures; second segment about as long as the third; somewhat coarsely aciculated, with a median ridge about as long as the third; third and following segments smooth, the fourth and fifth segments equal, united a little longer than third, sixth segment a little shorter than fifth; the seventh very short.

Hab.—Canobie Lake, N. H. (Bred from *Ephyra pendulinaria*.)

(35) **Protapanteles tortricis**, n. sp.

♀.—Length 1.8 to 2 mm.; ovipositor clavate, half the length of abdomen. Black, subopaque, clothed with a somewhat dense, greyish pubescence; head in front and the pro- and meso-thorax minutely punctulate; scutellum polished, feebly, sparsely, microscopically punctate; metathorax not long, finely wrinkled; mesopleura smooth, but pubescent; man-

dibles ferruginous; palpi and tegulæ white; antennæ much longer than the body, entirely black; legs, except coxæ and other noted exceptions, rufo-ferruginous; coxæ black, hind femora toward tips outwardly obfuscated, tips of their tibiæ and tarsi black, the basal joint of tarsi about as long as joints 2–4 united. Wings hyaline, the stigma, costa and post-stigmal veins brown, the internal veins pale or subhyaline, first abscissa of radius equal to the transverse cubital nervure. Abdomen as long as the thorax, black, with the lateral membranous margins of the first dorsal segment, and the first ventral segment at sides, rufo-piceous; first and second segments rugose, the third, except at apex, finely longitudinally aciculated, especially at the middle, somewhat smoother towards the sides; plate of first segment slightly more than $1\frac{1}{2}$ times longer than wide at apex, the sides nearly parallel; the second segment slightly shorter than the third, with lateral oblique furrows, widely separated at base: fourth and following segments very short, smooth.

♂.—Length 1.2 mm. Black, shining, impunctate; metathorax feebly wrinkled, shining; plate of first abdominal segment and the second longitudinally aciculated, the third, except very narrowly at extreme base, as well as the following, smooth, shining; the plate of first segment is fully twice as long as wide, the second segment being longer than the third; while the middle and hind pairs of legs are brown, with their trochanters and extreme base of their tibiæ, yellowish.

Hab.—Canobie Lake, N. H. (Bred from an unknown Tortricid larva feeding on *Comptonia asplenifolia*.)

(36) **Microplitis hyphantiæ**, n. sp.

♀, ♂.—Length 3 to 3.5 mm. Opaque black, pubescent; the middle of the mesopleura and the abdomen smooth and shining; two basal joints of antennæ, the mandibles and the mouth-parts, the tegulæ, and all legs, including coxæ, brownish-yellow, the posterior tarsi sometimes more or less subfuscous; flagellum brown-black.

Mesonotum minutely or finely scabrous, with a very delicate, nearly obsolete median carina, which does not quite attain the anterior margin and which on account of the pubescence is apt to be overlooked; mesosternal furrow long, broad and crenulate; metathorax coarsely rugose and more coarsely reticulated on the posterior face, with a prominent median carina. Wings faintly tinged with fuscous, the areolet large, the first branch of radius not or scarcely longer than the first transverse cubital nervure, or the inner side of the areolet, the recurrent nervure not longer than the length of the second discoidal cell, the transverse median nervure joins the first discoidal cell at about its basal third. Abdomen oval, polished, with the plate of the first segment in ♀ broad, trapezoidal, only a little longer than wide at apex, shagreened; in ♂ this plate is somewhat longer with the sides slightly curved.

Hab.—Champaign, Ill. (Prof. S. A. Forbes), and Cambridge, Mass.

This species was first sent me by Prof. Forbes, who reared it from the larva of *Hyphantia cunea*. Dr. Dimmock reports having bred it from an undetermined noctuid larva feeding on Apple leaves.

As I have described above two species of Microgasterines in genera not yet characterized, I give here my table of the genera of the subfamily *Microgasterinæ*, taken from my forthcoming Monograph on the North American Braconidæ.

Table of Genera.

Marginal cell incomplete or wholly wanting.................................. 2

Marginal cell completely closed.

Front wings with two submarginal cells; antennæ 16-jointed. (1) Ecclites Först.

2. Marginal cell for the most part entirely absent with only the first abscissa of radius present.... 3

Marginal cell not entirely wanting with the radius present but shortened.

Antennæ 20-jointed; metanotum not strongly areolated, the radius not geniculate; hind part of cubitus emerging from the first discoidal cell............... ....(2) Acœlius Hal.

Antennæ 21-jointed; metanotum strongly areolated, the radius geniculate; hind part of cubitus emerging from the first discoidal cell... ....(3) Dirrhope Först.

Antennæ 13–14-jointed in ♀, in ♂ 14–16-jointed; metanotum not areolated; radius geniculate, the areolet incomplete but in position quadrate; hind part of cubitus interstitial with the fore part................ .... (4) Elasmosoma Ruthe. ? = Neoneurus Hal.

3. Front wings with 3 submarginal cells, although the second or the areolet is sometimes open behind and therefore confluent with the third....:.. 4

Front wings without or at the most with only 2 submarginal cells, the areolet not defined.

Front wings without submarginal cells, the first and second submarginal cells and the first and second discoidal cells confluent; mesonotum with a large fovea in front of the scutellum; antennæ 21-jointed; hind coxæ very long, cylindrical. (5) Cœlothorax Ashm., n. g.

Front wings with 2 submarginal cells, the discoidal cells distinct, separated; mesonotum normal; antennæ 14-jointed; hind wings without a radius or cubitus................. (6) Mirax Hal.

4. Antennæ 18-jointed.

Second submarginal cell or the areolet completely closed. 6

Second submarginal cell open behind and confluent with the third.

Clypeus entirely separated from the face by a distinct grooved line between the clypeal foveæ.................... 5

Clypeus not entirely separated from the face, the grooved line between the clypeal foveæ wanting.

Metathorax with a median carina.

Second abdominal segment not separated from the third by a deep transverse furrow; ovipositor never prominent, at the most sub-exserted; hypopygium acutely plow-share shaped.

(7) Apanteles Först.

Second abdominal segment separated from the third by a deep transverse furrow; ovipositor very long, always longly exserted; hypopygium not so acute.

(8) Pseudapanteles Ashm., n. g.

Metathorax without trace of a median carina, smooth or alutaceous and without areas, rarely with a slight median impression posteriorly which at the most is indistinctly margined behind.

(9) Protapanteles Ashm., n. g.

Metathorax with an areola or closed median area, ovipisitor always prominent............(Urogaster).

5\. Metathorax with a distinct median carina.

Ovipositor never prominent.................................(Apanteles).

Ovipositor very long, always prominent.........(Pseudapanteles).

Metathorax without a median carina or a median area.

Ovipositor very long....................................(Protapanteles).

Metathorax areolated or always with a distinct median area or areola.

Ovipositor always prominent...............................(10) Urogaster.

6\. Clypeus not entirely separated from the face.................................. 7

Clypeus entirely separated from the face.

Metathorax with a more or less distinct median area, areolet very small; second abdominal segment much shorter than the third.............................(11) Hypomicrogaster Ashm., n. g.

Metathorax with a prominent median carina; areolet not small; second abdominal segment usually longer than the third or subequal.

Second abdominal segment separated from the third by a deep transverse furrow.

Mesosternal furrow long, crenulate, abdomen very long, the sides parallel; plate of first segment oblong quadrate, as wide as the second; ovipositor long; last tarsal joint long and stout, the pulvillus large, longer than the claws.

(12) Hygroplitis Thoms.

Mesosternal furrow wanting, or shallowly impressed, smooth; abdomen not especially elongate, the sides never parallel; plate of first segment usually trapezoidal, ovipositor long; last tarsal joint and the pulvillus normal.... ....Microgaster Latr.

7. Hind tibial spurs very long, the inner spur fully two-thirds the length of the basal joint of tarsus; plate of first segment very narrow, linear...(13) Protomicroplitis Ashm., n. g.

Hind tibial spurs short, the inner spur scarcely one-third the length of the basal joint of tarsus; plate of first segment variable. (14) Microplitis Först.

(41) **Aphidius ribis, n. sp.**

♀.—Length 2 mm. Luteous; vertex and occiput, thorax *above* and ovipositor, black; flagellum, except base of first joint, brown-black; dorsal abdominal segments 2–4, the apical half of segment 5, and a spot on apex of segment 6, reddish-brown.

Antennæ 15-jointed, reaching to the middle of abdomen, very slightly thickened toward tips; flagellar joints 1–3 subequal, about four times as long as thick, or possibly slightly longer, the following joints very gradually thickening and shortening to the last, the fourth joint being about three times as long as thick, the penultimate only a little more than twice as long as thick, the last, the longest joint, almost as long as the two preceding united. Metathorax smooth, with median and lateral carinæ. Wings hyaline, the veins pale, tinged with brownish. Abdomen long, lanceolate, one-third longer than the head and thorax united.

♂.—Agrees with the female, except that the antennæ are longer than the body, filiform, 18-jointed, the flagellum black, the joints all delicately fluted, subequal in length, on an average about 2½ times as long as thick, except the last, which is nearly twice as long as the preceding, with sometimes an indistinct suture dividing it into two joints; mesopleura blackish; while the abdomen, except petiole, is mostly brown.

Hab.—Cambridge, Mass. (Bred from *Aphis ribis.*)

FAMILY ICHNEUMONIDÆ.

(47) **Hypotherentes geometræ, n. sp.**

♂.—Length 4.5 mm. Black; scape, except a lateral stripe outwardly, pedicel, ring-joint, fore femora, except tips, the middle femora and the tibiæ, except tips, and hind coxæ and femora, ferruginous; mandibles, palpi, tegulæ, anterior and middle legs, except as noted, hind trochanters, knees, a band on middle of hind tibiæ, tibial spurs, basal half of first joint of hind tarsi and sutures of following joints, white; hind tibiæ, with a black annulus near base, and their apical one-third, black; hind tarsi, except as already noted, fuscous; flagellum brown-black.

Head transverse, closely punctate, the face with sparse glittering or silvery pubescence; eyes large, extending almost to base of mandibles

and leaving only a linear space between; clypeus not separated from face, except slightly at sides. Thorax closely punctate, without distinct parapsidal furrows; the mesopleura concave beneath the wings; metathorax with the areola and petiolar area confluent, the lateral basal areas complete, the lateral middle areas open outwardly, the longitudinal carina being absent, the angular area or third pleural area distinct, but small; spiracles broadly oval. Wings hyaline, the stigma and veins, except the subcostal, which is white, are dark brown; areolet petiolate; transverse median nervure in hind wings straight, not broken. Abdomen fusiform, petiolate, and very finely coriaceous, about as long as the head and thorax united, black, with the apical edge of the petiole, the foveolæ of second segment and its apical two-thirds, the third segment, except at extreme base along the suture, and the following segments along the lateral ventral edges, as well as the venter, ferruginous; the petiole is as long as the hind coxæ and trochanters combined, the spiracles small, round and placed at its apical third, and from them extend a delicate carina to tip of segment; the third segment is about two-thirds the length of the second, wider than long; the fourth is scarcely two-thirds the length of the third, while the following are still shorter.

Hab.—Arlington, Mass. (Bred from an unknown Geometrid larva on *Betula alba.*)

(49) **Ischnoscopus synchloræ**, n. sp.

♂.—Length 5.2 mm. Head, thorax, antennæ, except the scape, hind tibiæ, except a narrow annulus at base, and tarsi, except a narrow annulus at base, black; scape, abdomen and rest of legs, except as noted below, rufous; mandibles, palpi, tegulæ, anterior coxæ and trochanters, their tibiæ outwardly and tarsi, middle knees, a streak on their tibiæ outwardly, as well as spurs and tarsi, white. Wings hyaline, the stigma and nervures brown.

Hab.—Canobie Lake, N. H. (Bred from larva of *Synchlora* sp., the old name for *Aplodes.*)

(50) **Mesochorus tachinæ**, n. sp.

♀.—Length 4.5 mm. Stemmaticum, the occiput surrounding the foramen; thorax, except posternum and anterior part of pronotum, and first and second abdominal segments, black; head, except anterior orbits and mouth-parts, which are white, antennæ, except toward tips, legs, and abdomen from apex of second segment, including the sheaths of ovipositor, honey-yellow; tegulæ, anterior coxæ and trochanters, white. Metathorax polished, delicately, subobsoletely areolated, the middle area very narrow. Wings hyaline, the stigma and veins brown, the costal vein toward base, a spot between stigma and parastigma and the post-stigmal vein, white. Abdomen smooth, the petiole twice as long as second segment, with only two slight grooves above, just in front of the spiracles, the third segment very slightly shorter than the second, the fourth about

one-third as long as the third, the fifth half the length of fourth, the following retracted, the ovipositor as long as the basal joint of hind tarsi; the longer spur of hind tibia only half as long as the basal joint of tarsus.

Hab.—Canobie Lake, N. H. (Bred from a puparium of a Tachinid fly which is parasitic on an unknown Tortricid larva.)

This species comes nearest to *Mesochorus basilis* Cr.

(53) **Neoeryma lophyri**, n. sp. (Neoeryma n. n. for Eryma Först. preoccupied.)

♀.—Length 7 mm. Black, finely microscopically punctate; face below antennæ produced into two points towards base of each antenna, the clypeus, mandibles, short space below mandibles and eyes, palpi, tegulæ, a point before and a short line beneath scutellums, basal half of posterior tibiæ and apical margins of abdominal segments (very narrow on the short terminal segment), white; legs red, middle tarsi, extreme tips of hind femora, apical half of their tibiæ and their tarsi black; wings hyaline, the stigma and nervures black.

♂.—Agrees well with female except the propectus and anterior coxæ and trochanters are white; the mesopectus is rufous and connected with a white longitudinal band on the lower part of the pleura which extends forward at a slight elevation and terminates before attaining the thorax, thus leaving a black triangular space between it and the fore part of the rufous mesopectus.

Hab.—Canobie Lake, N. H. (Bred from saw-fly larva, *Lophyrus* sp.)

(54) **Sychnoportus rufopectus**, n. sp.

♂.—Length 5 mm. Black, shining; head below ocelli opaque, metathorax opaque; mesopectus obscure rufous; mandibles, palpi, tegulæ, anterior coxæ and trochanters, second joint of hind trochanters, basal two-thirds of hind tibiæ, except a spot toward base outwardly, and extreme apical edges of abdominal segments 4–7, white, rest of legs rufous; wings hyaline, the stigma and nervure black, the areolet wanting; metathorax areolated; abdominal segments 1–3 shagreened.

Hab.—Canobie Lake, N. H. (Bred from an unknown Tenthredinid larva.)

(57) **Phœogenes phycidis**, n. sp.

♀.—Length 9 mm. Rufo-ferruginous; scape and pedicel above, flagellar joints 1–6 and 13–25, tips of hind femora, tips of their tibiæ and extreme apex of abdomen, black; flagellar joints 7–12, the tegulæ and a spot beneath, yellowish-white; head above, face and thorax minutely, sparsely punctate; metathorax completely areolated, the areas finely transversely rugulose; abdomen polished, the segments at the most very indistinctly and sparsely microscopically punctate, the petiole above towards apex perfectly smooth, impunctate, the gastrocœli transversely shallowly defined, the surface from them to the base very finely aciculated.

Head large, quadrate; flagellar joints 1-3 subequal, scarcely three times

as long as thick at apex. Wings hyaline, the stigma and veins brown-black.

Hab.—Canobie Lake, N. H. (Bred from larva of *Phycis rubrifasciella.*)

(59) **Acrobela tachinæ**, n. sp.

♀.—Length 1.8 mm. Head and thorax black, shining; scape of antennæ, legs, including coxæ and abdomen, brownish-yellow, or pale ferruginous; flagellum opaque, black; palpi whitish; labrum, mandibles, except teeth and a spot on cheeks at base of mandibles, honey-yellow; wings hyaline, the stigma and nervures brown.

Head transverse, polished, a little wider than the thorax, emarginated behind, the temples as wide as the eyes, the face and labrum with some whitish hair; antennæ longer than body, the first joint of flagellum a little longer than the second, the following gradually becoming shorter. Mesonotum, with distinct parapsidal furrows and the median lobe, with a median impressed line; scutellum smooth, subconvex, with a crenate fovea at base; metathorax rugose, sparsely pubescent; wings hyaline, the stigma elongate, thickened, wider than the first abscissa of radius, the radius originating considerably before its middle; second abscissa of radius about one-half longer than the first transverse cubitus, the second transverse cubitus scarcely half the length of the first; recurrent nervure joining the first submarginal cell before its apex; submedian cell a little longer than the median; abdomen much shorter than the thorax, subpetiolated, the first, second and third segments shagreened, the following smooth, shining; ovipositor black, scarcely visible beyond tip of abdomen.

Hab.—Canobie Lake, N. H. (Bred from a Tachinid puparium from an unknown Geometrid larva.)

(69) **Asphragis pulcherrimus**, n. sp.

♀.—Length 7 mm.; ovipositor 5 mm. Black, shining; clypeus, a line beneath eyes, mouth-parts, a dot on anterior orbits opposite the antennæ, line at summit of eyes, tegulæ, a short line before, a cuneiform mark on anterior margin of mesonotum, but widest and broadly separated at the indications of the parapsidal furrows, and the coxæ and trochanters more or less, white; the scutellum, mesopleura, most of the metapleura, and legs, except as noted below, red; antennæ black towards base, gradually becoming paler towards apex, being a light brown or brownish-yellow from the seventh joint, the flagellar joints 1–5 tinged with ferruginous at tips; anterior coxæ with a black spot at base behind, their trochanters blackish at base; middle coxæ mostly black behind and with a black streak at sides, their trochanters blackish at base; hind coxæ mostly black, with two white streaks outwardly, their trochanters black at base; middle femora at extreme base and their tibiæ at extreme apex, narrowly black; hind femora at base and apex, their tibiæ, except narrowly at base and at the middle outwardly, and their tarsi, except narrowly at base, black. Wings hyaline, the stigma and veins black; the areolet wanting. Abdomen

microscopically transversely aciculated, with the apical margins of dorsal segments 1 to 5, more or less narrowly white; venter white, with lateral black spots on segments 1–4.

♂.—Length 6 mm. Face, anterior orbits, cheeks, mouth-parts, sides of thorax, except the mesopleura superiorly, which is tinged with red, the coxæ and trochanters, and dorsal abdominal segments 2–5 at extreme apex, white; mandibles and hind coxæ streaked within and without with black, their trochanters and femora at base narrowly black; hind tibiæ at apex and their tarsi, except basally, which are whitish, fuscous. Abdomen almost smooth, without the microscopic transverse aciculations noted in the female.

Hab.—Canobie Lake, N. H. (Bred from an unknown Tortricid larva.)

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125 APRIL 1, 1897.

President Marlatt in the chair and Messrs. Ashmead, Patten, Gill, Schwarz, Motter, Pratt, Johnson, Benton, Kenyon, Busck, Banks, and Howard also present.

—Under the head of "Exhibition of specimens and short notes," Mr. Johnson showed *Tribolium madens*, a species which had been sent to him from Montana in mill products. This is the first record of such a habit in this northern species, and he also said that he had found the previously unknown larva of this species. He further showed a parasite of Gelechia cereallela caught in the act of oviposition. Mr. Ashmead determined this as probably a species of Dibrachys or Catoloccus.

—Mr. Schwarz showed specimens of *Trigonoscuta pilosa*, a maritime species collected by Mr. Hubbard at Palm Springs, Cal., and stated that Mr. Ulke possesses specimens of *Cercyon fimbriatum* which may also come from this locality. This latter species is also maritime, and Mr. Hubbard's finding tends to substantiate the theory that the Colorado desert was formerly an arm of the sea.

—Mr. Schwarz also showed a fragment of a specimen of a Dynastid genus new to North America and apparently allied to Golopha. This was found in the great mesquite forest south of Tucson, by Mr. H. Brown. He discussed the entomological evidence in regard to the supposed tropical character of the fauna of the lower Colorado Valley, and showed that, while many new

species are found there, only 5 or 6 genera of a tropical character have as yet been collected, and the evidence is insufficient to prove the region to belong to the neotropical. His remarks were based mainly upon the recent collections of Mr. Hubbard, who has captured more Coleoptera at Yuma than any other one collector. These specimens, however, were captured in the winter time, and summer collecting might produce stronger evidence in favor of the tropical idea. The speaker suggested that close collecting, if it were possible in the great mesquite forests southwest of Tucson, or in the Colorado desert itself, might show that the tropical elements enter our territory at these points rather than in the immediate valley of the Colorado River.

—Mr. Howard exhibited specimens of a new genus of Monophlebinæ taken by Mr. Hubbard on the creosote bush at Palm Springs, and said that the only American representatives of this subfamily of scale-insects are neotropical and that therefore this finding had some significance as substantiating Dr. Merriam's statements that this region is tropical.

Dr. Gill agreed with Mr. Schwarz and said that he did not think Dr. Merriam justified in mapping this region as tropical. He does not think, even with the forms which most guided Dr. Merriam, viz., the mammals and birds, that the evidence is complete. The fish fauna of the lower Colorado is poor, but all the forms are temperate in their character. The reptiles of the region offer the best evidence in support of the tropical idea, but even this is inconclusive.

—Mr. Schwarz exhibited further a curious spiny Psyllid which belongs to the genus Rhinocola, which Mr. Hubbard had collected in the same region, and spoke of the spiny character of the plants of the region and the apparent correspondence of the spiny armature of the insects.

Mr. Marlatt asked as to the connection between the spinosity of the plants and the insects. Mr. Ashmead considered it to be a plain case of protective resemblance and referred to the peculiar Heteropteron Pronotacantha as a species which profited in this way. Mr. Schwarz said that an insect living on a spiny plant is protected by the spines of the plant itself and theoretically needs no spines of its own. Mr. Marlatt said that with so

small an insect as the Rhinocola, in which the spines were microscopic, there could be no protective resemblance to plants. Dr. Gill said that the distribution of spines upon an insect would affect the play of the light and thus enable it to assimilate with its surroundings. Mr. Marlatt was of the opinion that these spines would prove to be of secondary sexual value and that their occurrence is not due to protective resemblance.

—Mr. Benton exhibited specimens of *Apis japonica* which had been sent to the U. S. Department of Agriculture by Professor Matsumuri, of Japan, and pointed out the differences between this species and Apis mellifica. He thought that its greater pubescence would make it a better pollenizer and that it would prove to be an active and energetic worker, so that possibly it might be well to introduce it into North America.

—Mr. Banks exhibited four rare species of Caddis flies, namely, *Neuronia pardalis* Walk., *Neuronia dossuaria* Say, *Halesus argus* Harris, and *Neophylax concinnus* McLach. He pointed out the resemblance of the second species to a scorpion fly and thought that this might be a case of protective mimicry. He further spoke upon the interest attaching to the Trichoptera through their close relationship with the Lepidoptera, which has recently been established.

—The following paper was presented :

THREE NEW SPECIES OF CHRYSOPIDÆ.

By NATHAN BANKS.

The lace-wing flies of the northeastern United States are probably mostly described, but those of the South and West have been little studied and doubtless will furnish many new species. The group is of much interest on account of its curious habits and life-history, and is also of considerable economic importance owing to the predaceous habits of the larvæ.

Chrysopa oculata has occupied in economic respects a place similar to that of *Lachnosterna fusca*. And just as the later studies of the May-beetles revealed many forms, so also the study of our golden-eyed or lace-wing flies will show that there are other species of nearly as much value as *Ch. oculata*.

The species of Chrysopa are exceedingly difficult to separate; the venation being remarkably constant in the various species, and other structural characters are of little avail.

Recourse has been taken to the markings of the head, which furnish, in most cases at least, a basis for natural classification. In this respect the genus is very similar to Œcanthus, in the crickets. As to the exact value of these cephalic markings, there will, of course, be various opinions. I have believed that Fitch carried it to an extreme, and that several of his so-called species are not entitled to specific or varietal rank. Yet these markings are of value, for in forms that to the eye appear certainly distinct the best characters for separation will be found to be these markings of the head.

Two of the species I describe below are from Colorado, both rather closely related to known forms; the one to the eastern *Ch. lineaticornis* Fh.; the other to the southwestern *Ch. punctinervis* McLach. The third, a species of Leucochrysa, comes from Alabama. All three have been collected by Prof. C. F. Baker.

Chrysopa sabulosa, n. sp.

Green; face yellowish, a short black stripe under each eye, broadest at tip, near the inner end is a small black dot; just below the antennæ is a transverse black mark. Above on the green vertex are two round black dots; the palpi are black. The antennæ beyond the second joint are black on their basal half; the basal joints are short and close together, and with a black stripe on the outer side, and a large black spot below. The prothorax is green, unspotted, very short, with a transverse furrow behind the middle. Thorax, legs, and abdomen pale green. Wings hyaline, with green veins, some transversals partly black, the divisory of third cubital black. Tip of wing broadly rounded, pterostigma quite distinct. Alar expanse 24 mm.

One specimen, Ft. Collins, Colo.

Differs from *Ch. lineaticornis* in more spotted head, in the large spot on lower side of basal joints of antennæ, in black divisory veinlet, and in shape of prothorax.

Chrysopa fraterna, n. sp.

Yellowish, marked with dark red brown. Face rather greenish, a short black stripe under each eye, and each side of labrum an elongate spot; a reddish band across the base of labrum and a spot in the middle. Two black lines between the antenna, diverging above, each side of venter near the eye is a black spot. Palpi broadly banded with black. Basal joint of antenna has a dark spot on inner side, and two lines above, second joint with a black ring, rest of antennæ pale. Thorax broadly margined each side with a red-brown stripe and a narrow line on the middle. Legs pale, a brown dot under tips of the anterior femora, and a band just before tip on posterior femora. Abdomen much spotted with dark red-brown. Wings hyaline, the subcosta, sector, cubitus and postcubitus dotted with brown; the transversal wholly dark. Tip of wing rounded; the sector of radius curves but slightly toward the radius.

One specimen, Ft. Collins, Colo.

Closely related to *Ch. punctinervis*, but larger and differently marked; quite noticeable by the band on hind femora.

Leucochrysa americana, n. sp.

Pale greenish. A transverse reddish spot under each antenna; above is a transverse red line bent downward in the middle, and giving off a spur between the antennæ. Vertex with two deep depressions. Antennæ wholly pale, longer than wings, basal joint short and stout. Prothorax short, narrowed in front; with a short black spot in the middle of the front margin, and a reddish-brown line on each anterior side. Legs pale. Abdomen pale, with a large reddish spot on the last ventral segment, and a dot on each side on the genitalia. Wings hyaline, rounded at tips; the hind pair narrowed and more acute; the pterostigma brownish, distinct. The third cubital cell much longer than the second, not very much broader; the divisory veinlet arising from quite near to the postcubitus. The sector of the radius is very much nearer to the radius at pterostigma than in the middle of its length. Alar expanse 27 mm.

One specimen, Auburn, Ala.

Easily separated from *L. floridana* by its smaller size and different markings.

In discussion Mr. Schwarz referred to the fact that we badly need synoptic tables of the lace-winged flies—the published descriptions are so widely scattered. Mr. Banks spoke of the characters used in classification and showed that for specific separation the characters are almost entirely colorational. Few or no structural characters of specific value can be found.

Mr. Ashmead stated that he had studied these insects to some extent and believed that if carefully studied venation would show characters of value.

Mr. Banks expressed himself as of the opinion that the venational characters are absolutely worthless. He showed that the two fore-wings of the same individual may differ in venation. Mr. Ashmead stated that the same difficulty exists with the dragon flies and with the Orthoptera, but that with prolonged study, even with this difficulty, Saussure has ascertained many excellent venational characters with the Orthoptera.

Mr. Marlatt said that a complicated venation should always be approached with caution and that in his opinion venation varies within specific limits in direct ratio to its complication. He

stated that he had noticed that the eggs of the different Chrysopas are variable both in length of stalk and in method of placing and suggested that the species might be separated in this way, Messrs. Schwarz and Ashmead having previously pointed out the variability of the larvæ of these insects.

126

MAY 13, 1897.

President Marlatt in the chair and Messrs. Schwarz, Coquillett, E. F. Smith, Busck, Fernow, Banks, Patten, Motter, Pratt, Gill, Ashmead, Howard, and Dr. Clifton Mayfield also present.

The President announced the death, on May 3d last, of Martin L. Linell, an active member of the Society, and made a few remarks appreciative of the value of Mr. Linell's entomological works, of his good qualities as a man and of the loss to the Society from his death. Upon motion of Mr. Howard, it was resolved that the Society publish a short sketch of Mr. Linell's life and work with a bibliography of his published entomological writings, and also a brief manuscript found upon his desk which will be entitled "Descriptions of New Heteromerous Coleoptera from North America."

MARTIN LARSSON LINELL.

Little is known of the early life of Linell, and the following data are taken from a short obituary note published by Mr. F. H. Chittenden in Entomological News (vol. 8, No. 6, p. 159): Martin Larsson Linell was born at Grönby, Sweden, June 24, 1849. At an early age he became interested in the study of nature and made collections of Swedish insects and plants. In the year 1870 he entered the university at Lund, where he distinguished himself by his proficiency in mathematics, biology, and languages. It was his father's intention to fit his son for the ministry, but young Linell abandoned the university career at the end of his third year and entered the railway mail service. In 1879 he married and came to America, where he obtained employment in a chemical laboratory at Brooklyn, N. Y. In his spare time he resumed his entomological studies and formed a collection of Coleoptera. He soon established for himself the reputation of being the best systematist among the New York entomologists. In 1888 he was called to Washington as an aid in the Department of Insects at the U. S. National Museum.

Before Linell's entrance into this office very little work had been done in arranging the vast material of insects at the Museum, excepting the Lepidoptera, which had been for some time in the charge of Mr. J. B. Smith. In bringing order in the collection, Linell's remarkable qualities as a working entomologist were clearly brought out. Hitherto only occupied with Coleoptera, he was able, within an incredibly short time, to master the intricacies of the classification of other orders so that in the course of a few years he managed to bring order into the entire collection. Very few persons are aware of the enormous amount of work accomplished single-handed by Mr. Linell, work of a most thankless nature, which left him no time to publish anything for himself. However, when the Department of Insects was placed under the curatorship of Dr. L. O. Howard, a better time dawned for Linell, since, by the employment of assistants, he was relieved, to some degree, of the tedious manual work which is inseparable from the maintenance of a large collection of insects. He now found time to return to the study of his favorite order, the Coleoptera, and commenced to publish papers which in quality are certainly above the average work done in descriptive entomology. But he enjoyed this most happy period of his life only for a short time, and on May 3, 1897, he died suddenly of heart failure. After years of toil for others, he was just entering upon systematic work for himself, when death came. The last few papers illustrate his rare ability and judgment as a systematist, and had his life been spared he would doubtless have soon stood well up in the ranks of the world's Coleopterists.

Mr. Linell was not only well versed in the broad field of general science, but was also remarkably proficient in many European languages. His knowledge of the Scandinavian languages was freely given to many of his co-workers in science.

Personally, Mr. Linell was quiet and retiring; absorbed in his chosen field of Nature, he found little time for amusement or society. He was wholly unselfish, and gave much to others, in time, knowledge, and direct scientific work. So patient was he that the daily routine of museum work was performed with a faithfulness rarely equalled.

The posthumous paper printed below includes all of the unpublished descriptions left by Mr. Linell and which were found

upon his desk after his unfortunate and sudden demise. The last description, that of *Hyporhagus texanus*, was completed the Saturday preceding his death, which occurred on Monday, May 3, 1897.—E. A. S.

THE ENTOMOLOGICAL WRITINGS OF MARTIN L. LINELL.

1. Note on Dytiscus. Entomologica Americana, vol. III, 1888, p. 27.
2. Notes on some Coleoptera. Entomologica Americana, vol. III, 1887, p. 175.
3. The habits of Goes and Oncideres. Entomologica Americana, vol. V, 1889, p. 39–40.
4. [Observations on *Megapenthes limbalis* Herbst and *M. granulosus* Melsh.] Proc. Entom. Soc. of Washington, vol. II, No. 1, 1891, p. 37.
5. [Report on a small collection of insects made during the Death Valley Expedition. By C. V. Riley.] Order Coleoptera. North American Fauna, No. 7. The Death Valley Expedition. Part II, Washington, 1893, pp. 239–243.*
6. Description of a new species of Golden Beetle [*Plusiotis Keithi* n. sp.] from Costa Rica. Proc. U. S. Nat Mus., vol. XVIII, 1895, pp. 77–78.
7. List of Coleoptera collected on the Tana River and on the Jombere Range, East Africa, by Mr. William Astor Chanler and Lieutenant Ludwig von Höhnel, with descriptions of new genera and species. Proc. U. S. Nat. Mus., vol. XVIII, 1896, pp. 687–716.
8. A pod-inhabiting Longicorn found at the Columbian Exposition. By F. H. Chittenden and M. L. Linell. Proc. Ent. Soc. Washington, vol. IV, No. 1, 1896, pp. 42–43.
9. New species of North American Coleoptera of the family Scarabæidæ. Proc. U. S. Nat. Mus., vol. XVIII, 1896, pp. 721–731.
10. Descriptions of new species of North American Coleoptera in the families Cerambycidæ and Scarabæidæ. Proc. U. S. Nat. Mus., vol. XIX, 1896, pp. 393–401.
11. A short review of the Chrysomelas of North America. Journ. New York Entomol. Soc., vol. IV, No. 4, 1896, pp. 196–200.

*[The determinations are solely due to Mr. Linell, and only the tabular arrangement was made by E. A. Schwarz.—E. A. S.]

12. New genera and species of North American Curculionidæ. Journ. New York Entomol. Soc., vol. V, No. 2, 1897, p. 49.
13. On the insects collected by Dr. Abbott on the Seychelles, Aldabra, Glorioso, and Providence Islands, with descriptions of nine new species of Coleoptera. Proc. U. S. Nat. Mus., vol. XIX, 1897, pp. 695–706.
14. New species of Coleoptera of the family Chrysomelidæ, with a short review of the tribe Chlamydini. Proc. U. S. Nat. Mus., vol. XX, 1897, pp. 473–485.*
15. A new nearly blind genus of Tenebrionidæ. Entomol. News, vol. VIII, 1897, pp. 154–156.
16. A new species of Ægialites [*Æ. stejnegeri*]. Canad. Entomol., vol. XXX, 1898, pp. 74–75.
17. On the Coleopterous Insects of Galapagos Islands. Proc. U. S. Nat. Mus., vol. XXI, 1898, pp. 249–268.
18. Descriptions of some new species of North American Heteromerous Coleoptera. Proc. Entomol. Soc. of Washington, vol. IV, No. 3, 1899, pp. 180–185.

DESCRIPTIONS OF SOME NEW SPECIES OF NORTH AMERICAN HETEROMEROUS COLEOPTERA.

By Martin L. Linell.

Tenebrionidæ.

Eusattus coquilletti, n. sp.—Form and size of *difficilis*, Leconte. Oval, convex, feebly shining. Head finely punctate; clypeus broadly emarginate, rounded at the sides, margin narrowly reflexed. Thorax very broadly emarginate at apex, straight at the middle of the emargination, the angles very obtuse; sides finely margined, narrowly and feebly impressed along the margin, broadly rounded and convergent before the middle, subparallel behind the middle with the hind angles comparatively short and obtuse, not at all everted; disc alutaceous, sparsely and finely punctate. Elytra at base slightly broader than thorax, without lateral margin, feebly carinate; surface alutaceous with small sparse submuricate granules. Epipleuræ gradually wider to base, sparsely punctate and hairy. Prosternum sparsely punctate, the apex narrowly oval with distinct margin. Abdomen sparsely punctate. Legs with sparse short setæ.

* This and the following papers were published after the death of the author. Two other papers treating on the insects collected by Dr. L. Stejneger in the Bering Sea region are in the hands of the printer but their titles cannot be given here.

Length 11 to 11.5 mm. Width 6 mm.

Type No. 4168, U. S. N. M., nine examples from Los Angeles County, California, collected by Mr. D. W. Coquillett.

This species superficially resembles *difficilis*, Leconte, but the latter has the apex of the prosternum simple, the thorax narrowed from the base with much narrower, deeply emarginate apex and the posterior angles longer, slightly erected and embracing the sides of the humeri. Intercalated in Dr. Horn's synoptic table, *E. coquilletti* takes its place next after *politus*, Horn, which has the hind angles of thorax still more obtuse, the sides rounded from the base and the apex nearly semicircularly emarginate.

Eleodes insularis, n. sp.—First joint of anterior tarsi in the male with a large dense brush of golden hairs at the apex beneath. Anterior femora with a small acute tooth in the male, obtusely angulate in the female. Elongate, black, feebly shining. Antennæ robust, much longer than head and thorax. Head with a smooth space on vertex, the front and epistoma coarsely punctate. Thorax subquadrate, slightly narrower at apex than at base; sides finely margined, broadly and evenly rounded; anterior angles subacute, slightly prominent, posterior angles obtuse; disc moderately convex, sparsely and finely punctate. Elytra at base not broader than the base of thorax, gradually wider, widest at apical third, much broader in the female, suddenly declivous posteriorly and slightly produced at apex; disc moderately convex, slightly depressed along the suture in the female, with regular distant series of fine punctures, the intervals very sparsely and minutely punctulate. Legs long and slender, densely and strongly submuricately punctate. Anterior femora with a distinct but obtuse tooth in the male, subangulate in the female. Anterior tibiæ with the spurs subequal in both sexes. Tarsi with the spines ferruginous, the first joint of the anterior pair in the male with a large dense brush of golden silky hairs at the apex beneath.

Length 15 to 16 mm.

Type No. 4169, U. S. N. M. Thirty-five specimens from Sta. Margarita Island, Lower California, collected by the "Albatross" Expedition of 1888. The species resembles somewhat *E. quadricollis*, Eschscholtz, but the thorax is widest at base, and the elytra are distinctly widest beyond the middle. All the specimens are uniform in sculpture, without any tendency to muricate punctuation. The unique sexual characters of the male require a new subgenus between the *Eleodes* proper and *Blapylis*.

Cœlocnemis rugosa, n. sp.—Elongate, deep black, feebly shining: Thorax very convex, broader than long; sides not angulate, broadly rounded anteriorly, sinuate posteriorly; hind angles rectangular; disc densely and strongly punctate, rugose at the sides. Elytra very convex, oval, widest beyond the middle, abruptly declivous posteriorly, the apex oval, not acuminate; disc densely punctate and transversely rugose, the serial

punctures somewhat larger and deeper. Ventral surface moderately punctate, prosternum and base of ventral segments rugose. Femora rugosely punctate, the posterior ones reaching the apex of elytra.

Length 19 mm.

Type No. 4170, U. S. N. M. Two examples, from Los Angeles County, California, collected by Mr. D. W. Coquillett.

The species resembles in form *C. dilaticollis*, Mannerheim, but is abundantly different by the thorax and elytra being strongly convex and rugose.

Conibius rotundicollis, n. sp.—Robust, oblong, convex, smooth, piceous, black, feebly shining. Head transverse, prominent at the sides before the eyes, strongly punctate; epistoma broadly emarginate; antennæ very robust, shorter than thorax, slightly incrassate to apex, third joint a little longer than fourth. Thorax one-half broader than long; apex truncate with the angles obtuse, sides scarcely depressed, strongly rounded, with a fine reflexed margin, not fimbriate, posteriorly arcuate, without angles; base broadly, feebly rounded; disc rather finely and sparsely, at the sides more coarsely and densely punctate, with a smooth median line. Elytra ovate, widest one-fourth from the base; humeri margined, obtusely rounded; surface distinctly alutaceous, with regular series of fine punctures, intervals entirely flat, with still finer irregularly scattered punctures. Epipleuræ broad, smooth. Abdomen polished, sparsely and finely punctulate. Legs robust. Anterior tibiæ strongly and gradually widened to apex, convex above, flattened beneath, the outer apical angle slightly obtuse, not at all rounded, the outer edge and hind surface denticulate. Tarsi short, slender.

Length 4 mm. Type No. 4171, U. S. N. M.

One example from San Diego, Texas, collected (April 29, 1895) by Mr. E. A. Schwarz. This specimen is nearest allied to *Notibius gagates* Horn, which is placed in the genus *Conibius* by Capt. Casey, but the dilated anterior tibiæ and rounded thorax will require a new subgenus according to his arrangement.

Anædus texanus, n. sp.—Elongate oval, depressed, ferruginous, darker above, sparsely clothed with rather long erect hairs. Antennæ slender, second joint short, third equal to fourth, last joint but slightly longer and wider than the preceding one. Eyes large, separated by a little more than their own width, viewed from above. Front very coarsely punctate at the sides, smooth along the median line. Thorax twice as broad as long, as wide as elytra at base, apex truncate with rounded angles; sides strongly rounded, subangulate at middle, sinuate behind, the margin feebly reflexed; base broadly rounded at middle, feebly sinuate near the sides with an impressed smooth fovea in front of the sinuation; hind angles rectangular, not prominent; disc feebly convex, very coarsely rather densely punctate, the intervals polished. Elytra feebly shining, densely punctate,

the punctures much smaller than those of thorax, with traces of smooth intervals on the disc. Ventral surface and femora shining, sparsely and finely punctulate. Tibiæ straight, slender. Tarsi slender.

Length 7.5 mm. Type No. 4172, U. S. N. M.

One example from Brownsville, Texas, collected (June 9) by Mr. E. A. Schwarz. The species differs from *A. brunneus* by its much larger size, the long third antennal joint (in *brunneus* scarcely longer than the second) and the wider thorax with less acute hind angles. It is also very distinct from all the Mexican species, described by Champion.

Platydema inquilinum, n. sp.—Regularly elliptical, moderately convex, entirely ferruginous, somewhat darker above, feebly shining. Prosternum arcuate between the coxæ, deflexed behind. Clypeus as long as two-thirds the distance between the eyes in front, separated by a shallow impression, which is transverse to near the eye, then angularly deflexed to the broadly rounded side margin of the head; front margin as broad as the distance between the eyes; surface convex, finely obsoletely punctulate. Front feebly convex, more strongly and densely punctate. Antennæ gradually thickened, subserrate, sparsely pubescent. Thorax relatively very long, evenly convex; sides broadly rounded and convergent from the base, margin narrowly reflexed; posterior angles acutely prolonged, anterior angle rectangular with rounded apex; base strongly bisinuate, distinctly margined the whole length; basal impressions punctiform; disc finely punctate, densely at the sides, more sparsely at the middle and obsoletely on the basal lobe. Scutellum broader than long, acute at apex, sparsely punctulate. Elytra with striæ of close-set fine punctures, the striæ not at all impressed on the basal half but deeply so toward apex; intervals flat, convex at apex, sparsely, still more finely punctulate. Ventral surface finely punctate. Legs finely pubescent and punctulate.

Length 4 mm. Type No. 4173, U. S. N. M.

Four examples, collected near Tucson, Arizona (Dec. 23) in nests of a wood rat (*Neotoma albigula*) by Mr. H. G. Hubbard. One example kindly presented to the National collection by Messrs. Hubbard and Schwarz.

Branchus opatroides Champion occurs in southern Texas. It is very much smaller than *B. floridanus*.

Genus *Pyanisia* Laporte de Castelnau, Hist. Nat. Ins. Col., II, 1840, p. 235.—This genus is the only representative in the New World of the tribe *Amarygamides*, which differs from *Meracanthides* by the unarmed femora and the long metasternum. Two species have been found within the United States, *P. opaca*, Solier, and *P. tristis*, Castelnau. The former has the base of the thorax broadly rounded, the latter strongly bisinuate. *P. tristis*

was collected at Brownsville, Texas, by Prof. C. H. T. Townsend.

Cistelidæ.

Genus *Charisius* Champion. (Biol. Cent.-Amer. Ins. Coleopt., vol. IV, Pt. 1, p. 421).—A genus of Cistelidæ having the anterior and intermediate tarsi with the third and fourth joints and the posterior with penultimate joint broadly lobed, prosternum obliquely sloping in front, body glabrous, winged, thorax narrow with a transverse basal groove, mandible slightly bifid. It should take its place in our list between Allecula and Hymenorus.

Charisius floridanus, n. sp.—Elongate, subparallel, convex, shining reddish brown. Head rather sparsely, somewhat coarsely punctate. Thorax as long as broad, sparsely, somewhat coarsely, unevenly punctate, sides rounded in front, subsinuate before the straight hind angles, disc obsoletely canaliculate, basal foveæ shallow. Elytra parallel for two-thirds the length; striæ deeply impressed, except at base, coarsely punctate; the sutural stria not different from the others; intervals convex, very finely alutaceous with a single row of fine punctures; epipleura at basal half with a row of coarse punctures. Thorax beneath finely and sparsely punctate along the middle, coarsely but sparsely on the sides, metasternum with a shallow canaliculation behind; abdomen finely obsoletely punctulate. Male: anterior tibiæ simple, anterior tarsi with basal joints lobed; fifth ventral segment flattened. Last ventral segment with the lateral lobes curved and spoon-shaped, the central sheath curved and with rounded apical margin.

Length 7 mm. One example from Cocoanut Grove, Fla. Type No. 4174, U. S. N. M.

Very closely allied to *C. interstitialis*, Champion, from Jalapa, Mexico, but the male has not the central sheath of the last ventral acuminate as in that species.

Monommidæ.

Hyporhagus texanus, n. sp.—Elliptical, convex, black, moderately shining; anterior and lateral margins of the thorax ferruginous. Thorax nearly twice as wide as long, feebly shining; apex subtruncate, three-fifths as wide as the base; sides distinctly arcuate from the base, margin thin, but strongly reflexed at middle; posterior angles acute; disc convex at middle, broadly depressed towards the sides except at the base, densely and finely, in the depression more coarsely and rugosely, punctate. Scutellum triangular, smooth. Elytra with rows of punctures that are finer and more distant but still very distinct nearer the suture, larger and rounded on the middle, the outer striæ finely carinate; intervals finely and sparsely punctulate; surface more shining along the middle. Ventral surface piceous, shining, sparsely punctate along the middle, strigose at

the sides, last four ventral segments finely and densely punctulate. Emargination of mesosternum in front broad and shallow. Anterior tarsi of male with two joints dilated, the basal joint with dense golden pubescence, the next two with brownish pubescence beneath.

Length 5 to 6 mm. Six examples collected in decaying *Opuntia engelmanni* at San Diego, Texas, by Mr. E. A. Schwarz. Type No. 4175, U. S. N. M.

This species is easily distinguishable from the previously described species by the very short thorax with arcuate sides, the carinate lateral striæ and the sexual characters.

—Under the head of "Short Notes and Exhibition of Specimens," Mr. Fernow referred to the recent increase of pin-holes in timber from the Southern States. The insect producing the damage is probably some Ptinid beetle, but there is a possibility that it may be a Scolytid. He expressed the hope that it would prove to be the latter, since then its ravages may be met. If it turns out to be a Ptinid, however, there is little hope of a remedy unless it should be ascertained that deadening the trees at another season than that now employed will prove efficacious in preventing damage. He pointed out the interesting fact that the rapidly growing interest in forest management in the United States will, no doubt, afford careers for future economic entomologists.

Mr. Schwarz stated that pin-holes, so called, are caused either by Ptinids or by inside feeding Scolytids, and spoke somewhat at length on the habits of these groups. He showed further that damage by beetles of the genus Lyctus is becoming vastly more common than it was even a few years ago, and that he is at a loss to account for this increase, unless there has been some change in the method of drying timber.

—Dr. Smith showed Beijerinck's recently published paper on the "Cecidio-genesis and alternation of genera of *Cynips calicis*," and briefly reviewed the work.

Apropos to this paper, Mr. Ashmead recalled the fact that alternation of generations had already been established in this country in the case of a species of the genus Callirhytis, namely, by Dr. Riley with *C. operator*.* Mr. Fernow referred to the fact that

* Vide Science, 1895, p. 6, reprint, April 26.

Cynips calicis occurred originally only in the Mediterranean region, and queried how it could have reached the Netherlands. He was answered simultaneously by Messrs. Schwarz and Howard that it was obviously a commercial importation in the galls. Mr. Ashmead referred to the fact that European Cynipids do not attack the imported American oaks in the Kew Gardens, London.

— Mr. Schwarz exhibited specimens of *Phodago alticeps* Lec., hitherto considered a rather rare blister beetle, but which has been found by Mr. Hubbard to be extremely common in the desert region along the Gila River. He read the following extract from a letter received from Mr. Hubbard and dated Tucson, Ar., April 15, 1897:

HABITS OF PHODAGA ALTICEPS LEC.

By H. G. Hubbard.

. . . Over the burning sand on the low hills at Tacna on the lower Gila River there ran from time to time specimens of a strange black Meloid, *Phodaga alticeps*. This insect is most remarkable in its habits. It does not fly at all, although the wings are large and well developed and the wing-cases are as thin as tissue paper. The creature has long legs and runs about actively visiting the scattered patches of small flowering plants and sucking the nectar from such of the flowers as it can reach without leaving the ground. When pursued the beetle raises at once its thin and concave elytra and spreads its transparent underwings and speeds away like a little ship with black sails set wing and wing. I thought at first that it did this to assist its long legs in getting over the ground more rapidly by the aid of the wind, but I found that the real object is to uncover some bright orange-colored scent glands at each abdominal joint. These scent glands it has the power of protruding or concealing at will, exactly as in the Malachiidæ. The living insects when captured thus have the uncovered abdomen brightly maculate with orange at each suture along the sides. But when dead these spots entirely disappear and the abdomen becomes uniformly black again.

I gathered a large series of this species although it was hot work chasing them over the burning hillside at a temperature of 120° at noonday. They were not very alert, however, and were not difficult to capture, as they seem to rely upon the protection of their scent glands. I did not perceive any strong odor and suppose it is rather a repellant taste on which they rely. I found them only on this one hillside on the north of the Gila

River, although I saw a few on the desert mesa, between the river and the railroad station at Tacna.

Mr. Howard said that the orange color shown in this way was plainly a warning color, indicating the nauseous character of the insect, to which Mr. Schwarz replied that he had seen seventeen Meloid beetles taken from a single bird stomach, which was submitted to him some time since by Dr. Merriam. Mr. Ashmead considered that the red markings might, in reality, be protective in connection with the character of the surroundings.

— Mr. Schwarz exhibited and remarked upon two species of Coleoptera recently discovered by Mr. H. G. Hubbard in the southwestern portion of the United States, and which represent two genera new to our fauna. The first is *Cylidrella mollis* Sharp, an extremely slender form of the family Trogositidæ (allied to Nemosoma) which was bred at Washington, D. C., from a piece of solid wood of *Parkinsonia torreyana* and which was infested by an undescribed Scolytid (*Hylocorus parkinsoniæ* Schwarz, MS.). There can be no doubt that the Cylidrella is parasitic on this Scolytid. Several specimens were bred from the Parkinsonia wood which was cut out by Mr. Hubbard from a tree in the Indian reservation at Yuma, Arizona, and although not one of the specimens agrees in coloration with the unique type described by Dr. Sharp from Guatemala, there is very little doubt about the specific identity. The second species is a Latheticus (family Tenebrionidæ, tribe Ulomini), undoubtedly distinct from the only known species of this genus, *L. oryzæ* Waterhouse, which has been found in rice brought to England from India. This new species was found by Mr. Hubbard under burned bark of the Mesquite (*Prosopis juliflora*) at Indio in the Colorado desert of southeastern California. The occurrence of a second species of this genus at a locality so remote from the original habitat of the type species is certainly remarkable.

In discussion, Mr. Ashmead asked as to our previous knowledge of the habits of Cylidrella. Mr. Schwarz replied that the Biologia Centrali Americana, in which the genus was described, is not exceeded by any other work in the paucity of statements regarding habits of the insects. He considered the name "Biologia" a

misnomer. Mr. Pratt remarked that the collectors for Messrs. Godman and Salvin had no time to study habits, since they were told simply to collect as much material as possible.

—Mr. Banks presented the following paper:

SOME SPIDERS FROM NORTHERN LOUISIANA.

By Nathan Banks.

During the summer of 1891 I gathered a small collection of spiders from the vicinity of Shreveport, Louisiana. Although there are few peculiar or strange species in the collection, still it is of some interest, as so little is at present known of the distribution of our spiders. Yet there are several uncommon species, at least uncommon to one acquainted chiefly with more northern forms. Such are the *Prodidomus rufus*, *Tetragonophthalma dubia*, *Acartauchenius texana*, and *Thargalia aurata*. Two species quite rare in the North are *Histiagonia rostrata* and *Ballus youngi*.

About 127 species are recorded in this list, distributed in twenty-one families. The collection is representative of the southern Mississippi Valley fauna. This differs from the South Atlantic fauna in having some southwestern species. Seven species appear to be new and are here described; a few others, principally in the Lycosidæ, may prove to be new when the southern forms of this family are better known.

THERAPHOSIDÆ.

Eurypelma hentzi Girard.

SCYTODIDÆ.

Loxosceles rufipes Duf.

FILISTATIDÆ.

Filistata hibernalis Hentz.

DYSDERIDÆ.

Ariadne bicolor Hentz.

ŒCOBIIDÆ.

Thalamia parietalis Hentz.

PHOLCIDÆ.

Pholcus phalangoides Fuess.
Spermophora meridionalis Hentz.

PRODIDOMIDÆ.

Prodidomus rufus Hentz.

DRASSIDÆ.

Gnaphosa sericata Koch.
Drassus bicolor Htz.
Cesonia bilineata Htz.
Prosthesima depressa Em.
Prosthesima atra Htz.
Megamyrmecion lepidium n. sp.

CLUBIONIDÆ.

Clubiona obesa Hentz.
Clubiona abboti Koch.
Chiracanthium inclusa Hentz.
Anyphæna gracilis Hentz.
Anyphæna decepta n. sp.
Gayenna parvula n. sp.
Phrurolithus alarius Hentz.
Thargalia ornata Hentz.
Thargalia aurata Hentz.
Thargalia sp.

Agalenidæ.

Agalena nævia Hentz.
Tegenaria sp.

Dictynidæ.

Dictyna sublata Hentz.
Neophanes pallidus Marx.

Theridiidæ.

Theridium tepidariorum Koch.
Theridium murarium Em.
Theridium frondeum Hentz.
Theridium albidum Bks.
Theridium australis n. sp.
Theridium inornatum n. sp.
Theridula sphærula Hentz.
Theridula quadripunctata Keys.
Steatoda borealis Hentz.
Teutana triangulosa Walck.
Lithyphantes fulvus Keys.
Lathrodectes mactans Koch.
Mysmena bulbifera Bks.
Histiagonia rostrata Em.
Ceratinella micropalpis Em.
Ceratinella emertoni Cambr.
Ceratinella lætabilis Cambr.
Ceratinopsis similis Bks.
Cornicularia sp. [near communis.]
Spiropalpis spiralis Em.
Lophocarenum crenatum Em.
Erigone autumnalis Em.
Tmeticus tridentatus Cambr.
Tmeticus parvus n. sp.
Acartauchenius texana n. sp.
Linyphia communis Hentz.
Floronia coccinea Hentz.
Bathyphantes anglicanum Hentz.
Bathyphantes formica Em.

Mimetidæ.

Mimetus interfector Hentz.

Epeiridæ.

Acrosoma rugosa Hentz.
Mahadeva verrucosa Hentz.
Epeira strix Hentz.
Epeira domiciliorum Hentz.
Epeira trivittata Keys.
Epeira vulgaris Hentz.
E. volucripes Keys.
Epeira prompta Hentz.
E. parvula Keys.
Epeira bombycinaria Hentz.
Epeira insularis Hentz.
Epeira labyrinthea Hentz.
Epeira displicata Hentz.
Epeira foliata Hentz.
Epeira infumata Hentz.
Plectana stellata Hentz.
Abbotia gibberosa Hentz.
Abbotia placida Hentz.
Cyclosa conica Pall.
Argiope riparia Hentz.
Argiope transversa Em.
Argyroepeira hortorum Hentz.

Tetragnathidæ.

Tetragnatha grallator Hentz.
Tetragnatha laboriosa Hentz.

Uloboridæ.

Uloborus plumipes Lucas.

Thomisidæ.

Xysticus gulosus Keys.
Xysticus maculatus Keys.
Synema parvula Hentz.
Misumena spinosa Keys.
Misumena oblonga Keys.
Runcinia aleatoria Hentz.
Philodromus vulgaris Hentz.
Philodromus imbecillus Keys.

Lycosidæ.

Lycosa scutulata Hentz.
Lycosa ocreata Hentz.
Lycosa carolinensis Hentz.
Lycosa riparia Hentz.
Lycosa sp?
Trochosa cinerea Fabr.
Trochosa sp?
Pardosa milvina Hentz.
Pardosa sp? [near saxatilis.]
Pardosa sp? [near milvina.]
Pardosa sp? [young.]

Aulonia funerea Hentz.
Ocyale undata Hentz.

OXYOPIDÆ.

Oxyopes salticus Hentz.
Peucetia viridans Hentz.

PODOPHTHALMIDÆ.

Tetragonophthalma dubia Hentz.

ATTIDÆ.

Phidippus audax Hentz.
P. tripunctatus Hentz.
Phidippus rufus Hentz.
Phidippus insolens Hentz.
Philæus multicolor Hentz.
Philæus rimator Hentz.
Dendryphantes octavus Hentz
Dendryphantes nubilus Hentz.
Dendryphantes retarius Hentz.
Icius mitratus Hentz.
Astia vittata Hentz.
Cyrba tæniola Hentz.
Marptusa familiaris Hentz.
Admestina tibialis Koch.
Saitis pulex Hentz.
Habrocestum cœcatum Hentz.
Habrocestum cristatum Hentz.
Ballus youngi Peck.
Zygoballus parvus Hentz.
Zygoballus sexpunctatus Hentz.
Homalattus cyaneus Hentz.
Synemosyna scorpiona Hentz.
Salticus albocinctus Koch.

NEW SPECIES.

Megamyrmecion lepidum, n. sp.

Length ♀ 4.6 mm.; ceph. 1.8 mm. long, 1.1 mm. wide; pat. plus tibia IV 2. Cephalothorax uniform reddish, eyes partly surrounded with black; abdomen pale grayish, with a central darker stripe which covers the whole of the tip of the abdomen and is expanded on each side somewhat before the middle to surround an impressed dot; legs reddish, the patella and tibia I blackish; mouth-parts and sternum reddish, the latter with a brownish edge; venter gray, darker near tip; spinnerets pale, surrounded by a brown line; epigynum dark red-brown. Ceph. very narrow in front; eyes close together, the P. M. E. larger than the others and oval in shape, not half their diameter apart, closer to the P. S. E. than to each other; A. M. E. about half their diameter apart, and closer to the A. S. E. than to each other. Sternum a regular oval; fourth pair of legs the longest, the scopulas nearly absent, no spines beneath on tibia I, and none above on tibia IV. Abdomen depressed, about twice as long as wide. The epigynum shows an area longer than broad, truncate in front, rounded behind, containing a median cavity which is nearly filled by two spatulate bodies that project beyond the posterior margin of the cavity.

One example, Shreveport, La. Readily separated from the Californian species by its smaller size, marked body, different epigynum, etc.

Anyphæna decepta, n. sp.

Length ♀ 6–7 mm. Cephalothorax yellowish, clypeus and mandibles reddish brown or blackish; legs pale, darker near tips; sternum pale;

abdomen whitish or grayish, sometimes with a basal spear-shaped mark. Posterior eye-row procurved and longer than the anterior row, which is straight; A. M. E. about as large as A. S. E. Legs 4, 1, 2, 3; tibia IV no longer than tibia I, but the metatarsus IV much longer than that of leg I; spined most numerously toward the tips. Ventral furrow three times as far from spinnerets as from the epigynum; the latter shows a large rounded depression, broader than long, open and with divaricate edges behind, a little median cavity near the front part of depression.

Several specimens from Shreveport, La., and Brazos County, Texas. Readily distinguished from *A. fallens* Htz. by the absence of markings.

Gayenna parvula, n. sp.

Length ♀ 5 mm. Cephalothorax yellowish, darker on the head; mandibles and lip dark brown or black; sternum yellowish; legs pale, unspotted; abdomen brownish or dark grayish, in one specimen with a few indistinct spots. Head quite broad, low; mandibles prominent; A. M. E. smaller than A. S. E.; P. M. E. about twice their diameter apart; sternum once and a third longer than broad, truncate in front, broadest at second coxæ; legs moderately short, 4, 1, 2, 3; abdomen about twice as long as broad; ventral furrow nearer to the spinnerets than to the epigynum; the latter shows an area broader than long, trilobate behind, the side lobes pointed, the middle one larger and round, and from under each end of which there projects a dark line or ridge backward and outward.

Four examples from Shreveport, La., Kissimmee, Fla., and Washington, D. C.

Theridium australis, n. sp.

Length ♀ 2.6 mm., femur I 1.6 mm. Both dark and light specimens occur, dark ones with a reddish, light ones with a yellow cephalothorax, in both the head has a very distinct black spot extending down on the clypeus and usually a little pointed behind, the legs are yellowish without bands; the sternum reddish or yellowish; the abdomen gray with the serrated light stripe bordered with blackish which at each end is expanded into a large spot. Sometimes the stripe is nearly absent, but the large black spots, two above the spinnerets and one each side near base, remain very distinct. The cephalothorax is quite broad, much narrowed in front; the abdomen is sub-globose, and much more hairy than in the related species; the epigynum shows as a nearly straight transverse ridge, each end recurved in a small circle, in front are two long, rather slender, slightly curved dark marks.

Several specimens from Shreveport, La.

Theridium inornatum, n. sp.

Length ♂ 1 mm. Cephalothorax, legs and sternum yellowish, slightly blackish about the eyes; abdomen grayish. Similar to *T. unimaculatum*, but not one-half as large, without any black spot above or around the spinnerets. Leg I is long and large as in *T. unimaculatum ;* the femur is much longer than the cephalothorax, and the tibia is longer than the metatarsus. The male palpus is truncate at tip with a large, stout, sharp-pointed projection from the outer corner, it is nearly as long as the width of the tarsus; the bulb is quite simple, it shows the outline of a curved tube, the style is short, stout and straight, with two curved pieces near by.

One from Shreveport, La., and one from Kissimmee, Fla.

Tmeticus parvus, n. sp.

Length ♂ 1.1 mm. Cephalothorax, mandibles and legs pale yellowish, eyes on black spots; sternum a little darker; abdomen grayish. Cephalothorax rather broad, head not much narrowed, but little elevated. Posterior eye-row straight, P. M. E. less than their diameter apart, rather closer to the nearly equal P. S. E.; A. M. E. smaller, hardly their diameter apart, about as far from the rather larger A. S. E.; mandibles stout, vertical, two teeth on front of each; sternum triangular, about as broad as long, truncate in front, narrowly projecting between the hind coxæ behind; legs quite long, tibia plus patella IV rather longer than the cephalothorax, no spines above on tibiæ; abdomen small, hardly longer and no wider than the cephalothorax, rather depressed, pointed at the tip. Male palpi quite long, the tibia is considerably enlarged at tip and has several broad projections at the tip, a triangular one projecting above the tarsus, and one on each side, with a smaller one below; the hook of palpus is rather narrow, there is an indentation on the upper edge near the tip, which latter is nearly circular beyond. There is a large dark oval body at base of bulb from the side of which arises the style, which curves toward the tip and then outside of the tarsus, where its tip rests in a hyaline sheath, below the latter is a triangular dark body; near tip of the bulb and just below the upper part of the style are two sharp-pointed dark teeth, rather close together and nearly equal in size.

One male, Shreveport, La.

Acartauchenius texana, n. sp.

Length ♂ 2 mm.; ♀ 2.5 mm. Cephalothorax yellowish or reddish, eyes with black rings; legs whitish or yellowish; abdomen whitish with a central black stripe and several apical black chevrons; sternum yellowish or reddish with a dark edge; venter pale; sides of abdomen are sometimes dark. The head of the ♂ is elevated and tipped with several strong black hairs; the elevation bears the P. M. E. near its base, they are very remote from the smaller A. M. E., from which the head slopes back to the top of the elevation. The mandibles are of moderate size and vertical;

the sternum is about as broad as long, and pointed between the hind coxæ; the legs are of moderate length, clothed with fine hair, and some long bristles; the abdomen is nearly twice as long as broad, rather convex above, rounded at base. The epigynum shows two oval dark cavities about their diameter apart, from the inner end of which extends a dark line backward and outward. The male palpus has the tibiæ short with a small sharp-pointed projection at tip above; the bulb is crossed obliquely by two prominent dark tubes; the slender style projects beyond the tarsus and then curves backward for a ways; in a side view the middle portion of the bulb projects much more than other parts; the tarsus is short, and seen from above rather triangular in outline.

Several specimens from Shreveport, La., Holly Springs, Miss., and Brazos Co., Texas.

Mr. Ashmead asked as to the comparative richness of the spider fauna of that region. Mr. Banks replied in general terms showing that the Attidæ, for example, are more numerous in species in the south than in the north. He believes that 400 species could be collected in time in such a locality as Shreveport. He had collected 300 species in the vicinity of Ithaca, N. Y., but in northern localities there are many of the minute rock-inhabiting forms which are absent in the south.

Mr. Schwarz spoke of the inequality in faunistic value of different groups of insects, instancing especially the comparatively slight value which the order Diptera seems to possess in this respect, and asked Mr. Banks' opinion of the value of the spiders. Mr. Banks replied that, in his opinion, the spiders are one of the best groups for the study of geographical distribution. They are wingless and cannot pass natural barriers. He spoke in general of the geographical distribution of the spiders of the United States, showing that the regions mapped by Dr. Merriam are, in the main, substantiated by this group. Mr. Ashmead said that while theoretically the spiders should be definitely restricted in distribution, practically he knew of so many wide-spread species that he doubted the very great faunistic value of the group. He referred to the possibility of the gossamer spiders being carried for very long distances by the wind, and Mr. Schwarz also stated that spiders are especially apt to be distributed by the hand of man. Mr. Schwarz further said that on his return to Washington from Texas various spiders were found in his trunk, and asked

Mr. Banks whether these were Texas species and would introduce a new element into the spider fauna of the District of Columbia. Mr. Banks replied that they were probably species which were already wide-spread, since this is the case with nearly all species of spiders which inhabit houses.

Dr. Gill spoke at length on the subject of the relative value of different groups of animals from the faunistic standpoint. He showed that we must consider the problem not only from the morphological but also from the paleontological standpoint and illustrated this point in a somewhat detailed consideration of some of the striking features of the vertebrate faunas of South America, Africa and India, deducing from this consideration the conclusion that the primitive faunas of South America and Africa were derived from the same common source, while the forms common to or similar to each other in Africa and India were derived from a common source at a later period. This means that South America and Africa were connected at an early period and that the connection between Africa and India was made at a comparatively recent date. He contended that the fresh-water fishes are the best group for the study of questions of geographical distribution, largely on account of their necessary restriction to the bodies of water which they inhabit. He showed that while the mollusks in particular, and also the insects, have changed comparatively little since relatively early geological times, the mammals have changed very greatly and the fishes occupy in this respect a position intermediate between the mollusks and insects on the one hand and mammals on the other.

Mr. Banks stated that, in his opinion, water forms are not as good as land forms for the study of geographical distribution ; at all events this is the case with aquatic insects and arachnids. Fishes are by no means so limited in their distribution as land forms.

Mr. Marlatt spoke of the extraordinary distribution of *Bryobia pratensis*, which occurs from New England to California, and is known in the mountains of Montana at an elevation of 7,000 or 8,000 feet, remote from civilization, and also in the Southern States. What is probably the same species also occurs in Europe and in Australia. He considered this one of the most extraordinary instances of distribution known. Mr. Banks thought that

this species was simply an ordinary cosmopolite and showed that a number of other mites which he especially mentioned are also practically cosmopolitan. Mr. Howard called attention to the fact that this clover mite is peculiarly adapted to a commercial distribution. It may and probably has been carried commercially on nursery stock all over the world, while from the habits of the adults in crawling great distances in search of hibernating quarters it may be carried on anything coming from the household, or even upon the bodies of animals. Mr. Marlatt said that the occurrence of this insect upon cultivated trees and in households had only recently been recognized, and that its wide distribution was probably of very early occurrence. Mr. Schwarz stated that the occurrence of this Bryobia on very high mountains is very remarkable. Mr. Hubbard and himself have found it during the month of June in the Wasatch Mountains of Utah, at an elevation of from 10,000 to 11,000 feet. The eggs occurred in such quantities under stones between the snow fields that they could be scraped up by quarts.

—The next paper, which was presented by Mr. Schwarz, was entitled:

NOTE ON THE CEDRELA PSYLLIDS (GENUS FREYSUILA ALEMAN).

By E. A. Schwarz.

Many years ago, the late Dr. Eugene Dugès, of Guanajuato, Mex., sent to the lamented Dr. C. V. Riley some badly preserved specimens of a remarkable Psyllid, with the statement that this insect was greatly injurious to Cedrela trees.* They were then considered as belonging to an undescribed genus and species. What appears to be the same species was sent some years later by Dr. A. Ernst, from Caracas, Venezuela, and by Mr. F. W. Urich, from the island of Trinidad, W. I., the species being in either case marked as being injurious to Cedrela trees. Finally, in 1896, Dr. Alfred Dugès, of Guanajuato, Mex., forwarded additional specimens to Dr. L. O. Howard, with the statement that this Psyllid had been described by Dr. J. Aleman, under the name of *Frey-Suila dugesii*.

* Cedrela belongs to the family Sterculiaceæ. The wood of *C. odorata* (and perhaps also of other species of the same genus) has of late years acquired considerable economic importance, and it is stated that it is never attacked by any insect, not even the termites.

Dr. Aleman's account and descriptions extend over several pages in *La Naturaleza*, but are far from being satisfactory. In his descriptions he gives only characters common to all Psyllids, but the genus is recognizable from the rough figures.

I give herewith a more detailed description of this remarkable genus, for which the name proposed by Aleman has to be retained with a slight change.

Genus Freysuila Aleman.

Frey-Suila Aleman, La Naturaleza (2) 1, No. 1, 1887, pp. 21–26, tab. III.

Body robust. Vertex transverse, broadly excavated longitudinally along the median line, its front margin triangularly notched at middle, greatly elevated and obliquely truncate on each side of the excision; eyes large, prominent, the tempora well developed behind them; anterior ocellus not visible from above; frontal processes absent and represented on the underside of the head by a protuberance on each side beneath the antennal base and in front of the large knob-shaped clypeus. Antennæ unusually long; first two joints short and thick as usual, third joint extremely long, much wider than the following joints, densely asperate and densely pubescent, slightly tapering at apical portion, joints 4 and the following very thin and slender.

Pronotum and dorsulum greatly ascending posteriorly, the former slightly emarginate behind, lateral impressions shallow and confluent; dorsulum transverse, anterior margin hardly less convex than the posterior margin.

Elytra hyaline, membranaceous, elongate-oval, gently widening from base to apical third, apex broadly and regularly rounded; cubitus as long as, or slightly shorter than, discoïdal part of subcosta; a distinct pterostigma, stem of second fork not parallel with radius; tip of wing at the termination of the 4th furcal or close to it within the second marginal cell; legs extremely long and slender, tibiæ not dentate at base, tarsi normal; genital plate of male without lateral appendage, genital segment of female short.

The genus is readily known by the form of the antennæ and the very long legs. The front margin of the head recalls that of Homotoma (Psyllinæ) and Rhinopsylla (Triozinæ), but in both of these genera the vertex is more or less flattened. Freysuila is difficult to place in Dr. Fr. Loew's arrangement of the subfamilies of Psyllidæ, but if we adopt his system the genus can only be placed among the Aphalarinæ. However, this subfamily is very badly defined, and is either not separable from the Psyllinæ, or an entirely new arrangement of the genera has to take place. At any rate the genus differs from all genera placed among the Aphalarinæ by the great length and slenderness of the antennæ and the remarkable development of the third antennal joint.

The type of the genus is *F. dugesii* Aleman described from Guanajuato, Mexico; two other forms, which are either strongly marked varieties, or closely allied species, are known from Caracas, Venezuela, and Trinidad, West Indies. These three forms may be distinguished as follows:

Third antennal joint at most twice the length of the fourth, either entirely ochreous or pale only at base. Head and thorax without definite black markings.

- Third antennal joint almost twice as long as the fourth; fore-wings narrower, more narrowly rounded at apex; fourth furcal running into the tip of the wing (Guanajuato, Mex.)........ *dugesii* Aleman.
- Third antennal joint only one-third longer than the fourth; fore-wings wider, broadly rounded at apex; tip of wing within the 2d marginal cell (Caracas, Venezuela). .... var. *ernstii* Schwarz.

Third antennal joint at least two and one-half times longer than the fourth. Head and thorax with well defined black markings; fore-wings broadly rounded at apex: fourth furcal running into the tip of the wing; third antennal joint black (Trinidad, West Indies).......var. *cedrelæ* Schwarz.

In discussing this paper Mr. Ashmead stated that the very remarkable antennæ of Freysuila, which resembled in fact those of the saw-fly genus Xyela, would warrant the erection by Mr. Schwarz of at least a new tribe.

Some discussion ensued between Messrs. Gill, Ashmead, and Schwarz as to the advisability of forcing a form like this into the dichotomous table in preference to putting it aside and forming a new group. The discussion took a general turn, and Messrs. Gill and Ashmead favored the last view and Mr. Schwarz the former.

127

June 17, 1897.

President Marlatt in the chair and Messrs. Gill, Benton, Motter, Pratt, Waite, Chittenden, Ashmead, Schwarz, Patten, Howard, Heidemann, Fernow, Hine, and Matthis also present.

—Mr. Schwarz exhibited specimens of a probable new species of the genus Telegeusis Horn (family Drilidæ), collected by Mr. Hubbard at the Hot Springs (southwestern foot of Galiuro Mts.), Arizona, and spoke at some length of the remarkable palpi possessed by this genus. Mr. Ashmead asked why the palpi in certain genera in many groups are so prolonged. He noted a

new genus of Braconidæ, which he had recently discovered, which possessed very long palpi. Such genera seemed to occur in special number in certain regions of the West, and he instanced several which he had seen from Colorado. Mr. Schwarz replied that in Telegeusis the character occurs most probably only in the male, and that these long palpi have a sensitive function. The female is unknown, and probably larviform. The modification of the terminal joint of the palpi into a long organ occurs in many genera, and is difficult to explain.

—Mr. Marlatt, apropos to the remark made by Mr. Ashmead at the last meeting concerning the absence of oak galls on the American oaks in the Kew Gardens, stated that it would be interesting to know whether galls occur on the European oaks in these same gardens, and that, as a matter of fact, galls are rare in arboretums or cultivated grounds, instancing the oak group on the grounds of the Department of Agriculture. Wherever the ground is cared for and the leaves carefully raked up and burned, oak galls will be scarce or absent.

Mr. Ashmead said that he had found oak galls on the Smithsonian Grounds, and Mr. Marlatt replied that the Smithsonian Grounds are not so thoroughly cared for as those of the Department of Agriculture. Mr. Waite remarked that among the oaks in the Department of Agriculture there are very few native trees.

—Mr. Howard presented a paper, of which the following is an abstract:

A DIPTEROUS PARASITE OF LACHNOSTERNA.

By L. O. Howard.

(Author's abstract.)

The speaker exhibited two specimens of a Lachnosterna of the fusca group; one bore upon the thorax two groups of Dipterous eggs, one group consisting of five oval eggs laid side by side to the right of the median line, and the other group consisting of four similar eggs, similarly placed, to the left of the median line. The other specimen bore a cluster of seven such eggs to the left of the median line. Each of these eggs was about 1 mm. long, and of a light yellow-brown color. He had never seen similar eggs upon a Lachnosterna, nor had his associates, Messrs. Schwarz and Pergande, out of many thousands of specimens ex-

amined. The two specimens in question were collected June 4th, near Tannersville, New York, at an elevation of 2,500 feet. He referred to a note by Dr. Lugger, on page 50, volume I of the Proceedings of the Society, which recorded the oviposition of a Tachina fly upon the hard body of *Rhodobœnus 13-punctatus*, a bright-colored beetle which Dr. Lugger thought had been mistaken for a caterpillar by the Tachina fly. He also referred to the rearing of a fly of the genus Sarcophaga from a Carabid beetle, *Scarites subterraneus*, by Mr. Chittenden, as noted at a recent meeting of the Society. He further stated that, on one occasion, a Tachinid had been reared at Washington from *Lachnosterna inversa*, specimens of which had been placed in a box to get the eggs. The notes do not prove the parasitism, which was, however, strongly suspected. Two cases are also recorded in the notes in which Tachina flies have been bred from Lachnosterna larvæ.

The case possesses interest not only on account of its rarity, but on account of the fact that all of the Lachnosternas hide beneath the surface of the ground during the day, whereas the Tachina flies are exclusively day-flyers. Mr. Coquillett thinks that the eggs, from their color, may not be those of a Tachinid, but the speaker did not know what other insect to suspect.

Mr. Schwarz suggested that the peculiar fact brought out by Mr. Howard that the Tachina flies are day-fliers and the Lachnosternas night-fliers, might be modified since there is always a possibility that we may have night-flying Tachinids or day-flying Lachnosternas. Moreover, on account of the stony ground and comparative absence of soil in the locality where these specimens were collected, the beetles might not have been able to enter the ground during the day and were thus exposed to the attacks of Tachina flies; further, since Tachinids have been reared from Lachnosterna larvæ, and since these larvæ are always found at a considerable distance below the surface of the ground, may not the beetles carry the eggs to the vicinity of the larvæ? Further he had noticed that the beetles when hiding by day under leaves, etc , often assume an erect position, so that if any portion of the body were exposed, or nearly exposed, it would be the head and thorax. He emphasized the unusual character of the observation by showing that he had collected adult Lachnosternas by the quart during one season and had never seen such specimens as those exhibited by Mr. Howard.

—Mr. Ashmead presented the following paper:

ON THE GENERA OF THE CLEONYMIDÆ.

By William H. Ashmead.

The *Cleonymidæ* were first separated as a family by Francis Walker, in 1837; but he did not properly define the family or really appreciate the structural characters that separate it from allied groups, since of the ten genera recognized by him as belonging to it, he included no less than five genera which belong to the Encyrtidæ (Eupelminæ and Encyrtinæ), and one of these, *Macroneura* Walker, was based upon a male *Eupelmus*.

Still later, or in 1856, Dr. Arnold Förster recognized this family under the name *Cleonymoidæ* and defines five new genera, viz., *Tricoryphus*, *Heydenia*, *Plutothrix*, and *Tetracampe*.

Förster correctly excluded from the family *Stenocera* Walker, *Calosoter* Walker, and *Ericydnus* Haliday, but included three other genera not included by Walker, namely, *Trigonoderus* Westw., *Platynocheilus* Westw., and *Merostenus* Walk.

Tricoryphus Förster is, as I have already shown, the wingless female of *Cerocephalus* Westw., and it, as well as *Plutothrix*, *Tetracampe*, and *Platynocheilus*, does not belong to the family, the first named belonging to the *Spalangiinæ*, the others to the *Entedonidæ*.

The family *Cleonymidæ*, as now restricted, may be readily distinguished by the large triangular mesepisternum, by having either the anterior or posterior femora much swollen and sometimes toothed, or both are swollen, with the hind femora dentate or toothed beneath; if the legs are slender, the hind pair are very long, their coxæ long, cylindrical, while the radius in the front wing is very short and the postmarginal is very long, extending to the apex of wing (*Pelecinella*).

The family comes very close to the *Encyrtidæ*, and especially to the subfamily *Eupelminæ*, but the species may always be distinguished from any in this family by the absence of a movable or saltatorial middle tibial spur, the impressed mesopleura, the non-impressed mesonotum, and usually by the much longer marginal vein.

I have recognized four subfamilies, but one of these, the *Colotrechninæ*, is, however, provisional or supposititious, since it is based upon Thomson's genus *Colotrechnus*, which is unknown to me, and may or may not belong here.

The following tables will aid the student in recognizing the subfamilies and genera:

Family LXVI.—Cleonymidæ.

Table of Subfamilies.

Mesonotal furrows not at all indicated.. 3
Mesonotal furrows more or less distinct.
  Abdomen longly petiolated.. 2
  Abdomen sessile, or subpetiolate, never longly petiolate.
    Posterior femora much swollen and usually toothed or finely denticulate beneath (as in *Chalcis*, *Smicra*, &c.); abdomen usually depressed, the ovipositor not exserted; antennæ at the most 11-jointed..Subfamily I. Chalcedectinæ.
    Posterior femora not much swollen and very rarely toothed beneath, the anterior femora usually more or less enlarged, sometimes very much swollen and often excised or dentate beneath toward apex; ovipositor often, but not always, exserted; antennæ 11–13-jointed.
Subfamily II. Cleonyminæ.

2. Body of abdomen strongly compressed, sword-shaped, ending in a long ovipositor, the basal sheaths very broad; all legs slender, the hind pair very long, their coxæ long, cylindrical; front wings with the marginal and postmarginal veins very long, the latter extending to tip of wing, the stigmal vein very small, subsessile; antennæ 11-jointed, inserted close to the mouth ....Subfamily III. Pelecinellinæ.
3. Abdomen subsessile, compressed, conically produced toward apex; front wings with the postmarginal and stigmal veins very short, the knob of the latter nearly sessile, rounded; posterior tibiæ compressed, the hind margin denticulate.
Subfamily IV. Colotrechninæ.

Subfamily I.—Chalcedectinæ.

Table of Genera.

Hind femora much incrassated, minutely denticulate beneath........... 2
Hind femora much incrassated and armed beneath with large distinct teeth.
  Hind femora with several teeth, fourth segment the largest, transversely striated or aciculated........1. Chalcedectes Walk.
= Polychroma Westw.
= Polychromatium D. T.
  Hind femora with three large teeth........2. Cleptimorpha Walk.
  Hind femora with one large tooth towards apex, followed by three or four smaller teeth ......3. Chalcidiscelis* Ashm., n. g.

* Type Chalcidiscelis Koebelei Ashm. MS. from Australia.

2. Antennæ 10-jointed..4. Amotura Cameron.
Antennæ 11-jointed.
Abdomen ovate or conic-ovate.
Abdomen not depressed, convex beneath, the fourth segment longer than the third, the latter a little longer than the fifth; stigmal vein not short; metathoracic spiracles reniform.
5. Agamerion Hal.
Abdomen depressed, flat above and beneath, the third and fourth segments short, united shorter than the fifth; stigmal vein rather short; metathoracic spiracles oval.
6. Euchrysia Westwood.

Subfamily II.—Cleonyminæ.

Table of Genera.

Females.

Anterior femora less distinctly swollen and not excised dentate beneath 6
Anterior femora much swollen, or excised dentate beneath.
Pronotum not much narrowed and always wider than long..... 2
Pronotum much narrowed and lengthened, longer than wide.
Anterior femora greatly swollen but not excised dentate beneath; abdomen conically produced, but not much longer than the head and thorax united.
7. Heydenia Först.
Anterior femora much swollen, and excised dentate beneath; abdomen much elongated, conically produced.
8. Lycisca De Romand.
2. Eyes bare.. 5
Eyes pubescent.
Ovipositor very long.. 3
Ovipositor not prominent, at the most subexserted.
Abdomen conic-ovate or conically lengthened and strongly carinated along the sides...............9. Epistenia Westw.
= Dasyglenes Ashm.
Abdomen subrotund, oblong, or conic-ovate, the sides rounded, not carinated.
Labrum inconspicuous, hidden.............................. 4
Labrum conspicuous.
Abdomen conic-ovate....10. Cleonymus Latr.
Abdomen subrotund; antennæ 12-jointed, with 3 ring-joints..............11. Micradelus Walk.
3. Abdomen with the first and fifth segments the longest; antennæ 11-jointed..12. Belonea Westw.
Abdomen with the first segment longer than the three following, the third produced into a sharp triangular point at the middle; antennæ 9-jointed..13. Cameronella D. T.
= Panthalis Cameron

4. Abdomen oblong or long-ovate; parapsidal furrows only slightly indicated anteriorly; fifth segment nearly as long as the first four abdominal segments united, the second and third together scarcely longer than the fourth, the first and fourth subequal; front wings maculate..14. Ptinobius Ashm.

5. Wingless species.

Abdomen ovate, ending in a long ovipositor; antennæ 13-jointed, with 3 ring-joints..................................15. Cea Hal.

Winged species.

Abdomen as seen from above rotund, compressed or carinate beneath.

Front wings hyaline, the stigmal vein hardly two-thirds the length of the marginal and a little shorter than the postmarginal; metathorax with lateral folds, the spiracles oval-elliptic.................. 16. Tomicobia Ashm., n. g.

Abdomen conic-ovate, the segments subequal, the ovipositor not exserted.

Front wings with two transverse bands or maculæ; pronotum transverse quadrate, narrowed medially; pedicel not lengthened..........................17. Chiropachys Westw.

Front wings without bands or maculæ; pronotum transverse quadrate, but not narrowed medially, and well separated; pedicel much lengthened.

18. Schizonotus Ratzb.

Abdomen conic-ovate or conical, the terminal segments tubular, the ovipositor very long.

Last two abdominal segments very slender, tubular.

19. Thaumasura Westw.

Last five abdominal segments very slender, tubular.

20. Solenura Westw.

6. Mesothoracic furrows complete.. 7

Mesothoracic furrows incomplete, indicated only anteriorly.

Pronotum short, narrowed medially.

Marginal vein thickened, shorter than the postmarginal.

21. Zapachia Först.

Marginal vein not thickened.

Abdomen conical, the segments after the first, which is the longest, subequal.

Front wings with one transverse band, the stigmal club large....22. Acrocormus Först.

Front wings without a band, the stigmal club small...............................23. Caudonia Walk.

Pronotum very long, narrowed anteriorly.

Abdomen ovate, shorter than the thorax, the segments subequal, the middle tarsi incrassate.

24. Notanisus Walk.

7. Abdomen petiolate.. 8
Abdomen sessile.
Abdomen elongate, conically produced or acuminate at apex; postmarginal vein well developed.
Scutellum with a transverse grooved line before tip; head with rounded, convex cheeks.
Pronotum large, nearly quadrate.
25. Merostenus Walk.
(= Pterolytus Ratzb.)
Pronotum transverse.......26. Trigonoderus Westw.
Pronotum very short, visible from above as a fine transverse line.
Metanotum with a sharp median carina; antennæ 13-jointed; middle tibiæ normal.
27. Anoglyphis Först.
Metanotum short; antennæ 14-jointed; middle tibiæ much lengthened.
28. Macromesus Walk.
Scutellum without a transverse grooved line before tip; head triangular, narrowed anteriorly.
Middle tibiæ not dilated at apex.
29. Platygerrhus Thoms.
Middle tibiæ dilated at apex, their tarsi broad at base..................................30. Pegopus Först.
= Prosopon Walk.
Abdomen short, broadly oval, flat above, convex beneath.
Body entirely covered with rather dense white, scale-like hairs; front wings bare with the postmarginal vein wanting, the stigmal vein angularly bent and ending in a small subrotund knob.....31. Eutrichosoma Ashm. n. g.
8. Scutellum without a transverse grooved line before the tip.
32. Photismus Thoms.

Males.

Anterior femora less distinctly swollen and not excised dentate beneath. 5
Anterior femora much swollen or excised dentate beneath.
Pronotum not much narrowed, and always wider than long.... 2
Pronotum much narrowed and lengthened, longer than wide.
Front femora greatly swollen, but not excised dentate beneath; abdomen clavate, depressed..7. Heydenia Först.
Front femora much swollen, and excised dentate beneath.
8. Lycisca DeRomand.
2. Eyes bare.. 4
Eyes pubescent.
Abdomen carinate along the sides..............9. Epistenia Westw.

Abdomen not carinate along the sides, normal.

Labrum inconspicuous or hidden.................................... 3

Labrum conspicuous.

Metathorax with a median carina, the spiracles large, oblong or oval; flagellum subclavate, densely hairy, the joints of funicle wider than long.

10. Cleonymus Latr.

Metathorax without a median carina, the spiracles small, rounded, flagellum long, filiform, densely hairy, the joints of funicle long.

11. Micradelus Walk.

3. Front wings bifasciate or maculate.

Marginal vein slender, about twice as long as the stigmal; pronotum not short, the metathorax with a median carina, the head lenticular, much wider than thorax.

14. Ptinobius Ashm.

4. Front wings bifasciate.

Marginal vein not longer than the stigmal, the latter long, strongly clavate; pronotum short, transverse, slightly narrowed, the metathorax with a short median keel, the spiracles elliptic, the head transverse; pedicel shorter than the first joint of funicle. ....17. Chiropachys Westw.

Front wings hyaline, not fasciate.

Marginal vein longer than the stigmal, the latter not especially long, ending in a small knob; pronotum large, subquadrate, well separated.....................................18. Schizonotus Ratzb.

5. Mesothoracic furrows complete.................................... 6

Mesothoracic furrows incomplete or indicated only anteriorly.

Pronotum short, narrowed medially.

Marginal vein thickened, shorter than the postmarginal.

21. Zapachia Först.

Marginal vein usually not thickened.

Stigmal club very large........ .....Acrocormus Först.

Stigmal club small..................23. Caudonia Walk.

Pronotum long, narrowed anteriorly...........24. Notanisus Walk.

6. Abdomen petiolate... 8

Abdomen sessile.

Scutellum without a transverse grooved line before tip........... 7

Scutellum with a transverse grooved line before tip.

Pronotum large, nearly quadrate.....25. Merostenus Walk.

= Pterolytus Ratzb.

Pronotum transverse, but still not very short.

26. Trigonoderus Westw.

Pronotum very short, visible from above as a fine transverse line.

Metanotum not short, smooth, with a sharp median carina; antennæ 13-jointed.

27. Anoglyphis Först.

Metanotum very short, closely punctate; antennæ 14-jointed.......................Macromesus Walk.

7. Postmarginal vein well developed; body not clothed with scale-like hairs.

Middle tibiæ not dilated at apex...... ...29. Platygerrhus Thoms.

Middle tibiæ dilated at apex, the tarsi much thickened at base.

30. Pegopus Först.

= Prosopon Walk.

Postmarginal vein entirely wanting; body clothed with dense, scale-like white hairs.

Metathorax very short, abrupt, without median carina; head transverse, antero-posteriorly thin; antennæ 13-jointed, the joints of funicle transverse, subpetiolate, pilose.

31. Eutrichosoma Ashm., n. g.

8. Scutellum without a transverse grooved line before tip.

32. Photismus Thoms.

Subfamily III.—Pelecinellinæ.

This subfamily is represented by a single genus, *Pelecinella* Westwood, readily recognized by the characters given in my table of the subfamilies. See also my paper entitled "On the genus Pelecinella Westwood, and its position among the Chalcididæ." Proc. Wash. Ent. Soc., vol. iii, pp. 230–233.

Subfamily IV.—Colotrechninæ.

This is likewise based upon a single genus, *Colotrechnus* Thomson. It is unknown to me in nature, but evidently from Thomson's description belongs in this family.

Apropos to Mr. Ashmead's paper, Mr. Marlatt spoke of the danger of using published descriptions only as bases for synoptic work on account of the frequent omission of important characters in published descriptions.

—Mr. Howard made some remarks on the discovery of *Euproctis chrysorrhœa* in the vicinity of Boston, which were supplemented in discussion by Mr. Marlatt, who had just returned from Boston, and was able to give details as to the work which had been done against the insect, and as to the measures adopted by the State legislature. The paper was further discussed by Messrs. Schwarz and Matthis.

Mr. Schwarz remarked that it is wonderful that this species, as well as many other European insects, have not been introduced into America at an earlier date, and called attention to the fact that, as already pointed out by Osten-Sacken, the most unexpected introductions frequently occur, whereas those most to be expected may not be brought about for many years. He stated that this insect is one which is especially guarded against by police regulations in Germany, the inhabitants of a given district being notified on a certain day to destroy the larvæ upon their premises, and the police immediately thereafter inspecting the work and fining delinquents.

Mr. Matthis spoke of the special danger from this imported species. He said that it is one of the forms whose egg-masses are distasteful to birds through the admixture of hairs from the anal tuft of the female moth. For this reason birds will not touch it. He recounted his European experience with the species, and both he and Mr. Schwarz stated that the female flies well, and that the species may therefore spread in the adult stage.

OMISSION FROM PROCEEDINGS OF MAY 13, 1897.

The publication committee announces that through an unfortunate error no mention is made in the proceedings of the meeting of May 13, 1897, of the reading of an elaborate paper on the Genera of the Encyrtinæ by Mr. Ashmead. This paper has been withdrawn for publication elsewhere.

—Mr. Howard read a paper, of which he has submitted the following abstract:

THE THOMSON-MAYR PRIORITY QUESTION SETTLED.

By L. O. Howard.

It will be remembered that, at the last meeting of the Society, following the reading of the paper on the genera of the Encyrtinæ, by Mr. Ashmead, a discussion took place between Messrs. Ashmead, Schwarz, and the writer relative to the possibility that volume IV of Thomson's "Hymenoptera Skandinaviæ," the printed title-page of which showed the date 1875, was, in reality, published subsequently to Mayr's paper on the Encyrtinæ, which was read before the Zoölogisch Botanische Gesellschaft in Wien, December, 1875.

It has been established since this discussion took place that Mayr's paper was published not later than the end of January,

1876, since the receipt of the printed paper is acknowledged in one of the German periodicals published in February, 1876. It was supposed that the Thomson work might have been printed by signatures, and that while the first signature, containing the title-page, might really have been published in 1875, the later signatures might have been published at a considerably later date. The writer had addressed a letter to Dr. Christopher Aurivillius, of Stockholm, and, on June 7th, received a reply which practically settles the matter. Dr. Aurivillius writes, under date of May 12th, that he has gained full information on the subject through consulting Thomson's letters to Stål in the years 1875 and 1876. It appears that volume IV of the "Hymenoptera Skandinaviæ" was published in two parts, Part 1 containing pages 1 to 192, and including, on pages 112 to 183, his consideration of the Encyrtinæ, the only portion of the work about which there is a possible conflict. The first sheet, including the title-page with the date 1875, was printed in September or October, 1875. The second sheet (of 16 pages) was not printed on October 11th, 1875. The impression of the following sheets, or signatures, was delayed for the very significant reason that Thomson hoped to use some of Dalman's types of Encyrtinæ, which, at that time, had been loaned to Dr. Mayr. The last sheet was printed at the end of May, or in the first days of June. It will be noticed that I have used the word "printed" up to this time. On June 6th Thomson wrote that the first part was published, and that he intended to continue the printing in August. It thus appears that Part 1 of volume IV of the "Hymenoptera Skandinaviæ" was certainly not published before the latter part of May. Mayr's work, having been published the end of January, thus antedates Thomson's by four full months, and all coincident new genera should, therefore, be known by Mayr's names.

These facts have never been recorded, and are even unknown to Dr. Dalla Torre, the author of the great catalogue of the Hymenoptera of the world, since, in a recent paper in the Wiener Entomologische Zeitung, he adopts the convenience method of deciding the priority between these two writers as regards the genera of Encyrtinæ.

The paper was discussed by Messrs. Schwarz, Ashmead, Gill, Waite, and Howard.

Mr. Schwarz called attention to the fact that the first published announcement of the receipt of Part 1, volume IV, of Thomson's Hymenoptera Scandinaviæ which he was able to find occurred in the Entomologische Monatsblätter of April and May, 1877.

Mr. Ashmead expressed his pleasure at the settling of the long

disputed question, and spoke at some length on the importance of exact dates being printed on editions of author's extras, a matter which was further discussed by the other members mentioned.

128

OCTOBER 14TH, 1897.

Vice-President Gill in the chair, and Messrs. Ashmead, Banks, Schwarz, Fernow, Patten, Dyar, Fairchild, de Schweinitz, Swingle, Busck, Pratt, Motter, Benton, and Howard also present. The following new members were elected: Corresponding—A. L. Quaintance, Lake City, Fla., and J. S. Hine, Columbus, Ohio. Active—Harrison G. Dyar.

Under the head of "Short Notes and Exhibition of Specimens," Mr. Schwarz spoke of the collection of insects recently made by Henry G. Hubbard in southern Arizona. This collection is altogether the most extensive and valuable which has been made in that part of the country. In Coleoptera alone he estimates that there are between 300 and 400 species new to the fauna of the United States. He spoke at some length about the previous collections, by Drs. LeConte and Horn, by the Government surveys, by Morrison, and by Wickham. Morrison's sets, when sent abroad, were usually labelled "Sonora," and have thus been included in the *Biologia-Centrali Americana.* When sent to American workers, however, they are labelled "Arizona." They were probably all made, however, in the Graham Mountains, near Ft. Grant, and above Ft. Huachuca.

—Mr. Schwarz exhibited a specimen of the Scarabæid *Lissomelas flohri* Bates, a genus new to the United States, and allied to Cremastochilus. The specimens collected by Mr. Hubbard at Ft. Grant, Ar., however, were not found in ants' nests, but under old leaves, nor could any traces be found of thoracic glands, which are supposed to be attractive to ants. He spoke of the velvet-like coating on the rear half of the elytra, and said that in the specimens collected it was badly scratched, possibly by ants. He further generalized as to the Arizona fauna, stating that we do not know its Mexican limits, and remarked upon the great variation between the faunas of the valleys and of the mountains.

Mr. Fernow thought that this great difference was due entirely

to moisture changes. In Arizona, wherever an elevation of 5,000 feet is reached, there is rainfall and forests which are lacking at a lower elevation. Dr. Gill stated that the segregation of the Coleopterous fauna of California had been remarked upon 40 years ago by LeConte. Mr. Schwarz stated that LeConte did not go into the mountains of Arizona, and, in fact, failed to realize the difference between the California and Arizona faunas, because he was there in the winter-time. It is high time to explore southern Arizona from a biological standpoint, since cattle are fast doing away with the vegetation of the valleys and the mountain canyons, which will soon become deserts. In this statement he was supported by Mr. Fernow, and some further discussion ensued between Messrs. Fernow and Schwarz as to the character of the vegetation of Arizona, and its influence upon insect life. Mr. Ashmead confirmed Mr. Schwarz's statement as to the great richness and value of the collections made by Mr. Hubbard in southern Arizona.

—Mr. Banks exhibited specimens of *Chrysopa ypsilon*, each of which carried a minute Cecidomyiid fly on its wings. The specimens were collected by Mrs. Slosson in the White Mountains, and she states that it is a common habit. Mr. Banks stated that the Cecidomyiids were taking advantage of the Chrysopa to carry them from place to place ; that they probably in this way were carried to colonies of plant-lice upon which their larvæ might feed. Mr. Ashmead spoke of a parasitic wingless fly of the family Borboridæ living upon a snail which had been collected by Mr. Cook in Liberia. He agreed with Mr. Banks's conclusions. Mr. Schwarz suggested that possibly the Cecidomyiids might have become entangled upon the wings of the Chrysopas, and were thus trapped and unable to get a way. Mr. Banks, however, said that he had been informed by Mrs. Slosson that nearly all of the flies fell off when the Chrysopas were captured, and that, therefore, they cannot be entrapped.

—The first paper of the evening was presented by Mr. Ashmead, entitled "A new Cynipid Genus from Africa."*

In answer to questions by Mr. Schwarz, Mr. Ashmead stated

*After the presentation of this paper, Mr. Ashmead discovered that this new genus was identical with Oberthürella Saussure, and has withdrawn his description.

that there are no true gall-making Cynipids known in tropical Africa. The genus Rhoophilus has been described from Africa, but, in his opinion, this may not be a gall-making form.

—Mr. Howard, in view of the fact that several persons who had visited the tropics were present at the meeting, inquired as to the abundance of plant-lice in tropical regions, and was answered by Messrs. Fairchild and Ashmead, that they seemed to be much less abundant than in temperate regions.

—A short paper was read by Mr. Howard, entitled "Notes on the House-fly."*

In discussing this paper, Mr. Ashmead suggested the trial of chloride of lime, which is commonly used in the Southern States as a disinfectant and for sprinkling on garbage of various sorts.

Mr. Schwarz, apropos to the statement as to the desirability of killing the early flies, stated that, in his opinion, there is a fallacy involved in this general recommendation regarding injurious insects. Where a species breeds with such astonishing rapidity as does the house-fly, there is little use in killing part of the early females if others are allowed to escape. He stated that it made little difference to him whether one million of flies were bothering him in July or two millions!

Apropos to the incidental remark in the paper about the carrying of contagion by house-flies, Mr. Fairchild spoke of the prevalence of an eye-disease in the Fiji Islands. Very many natives have lost the sight of one eye, and some of two, from this disease, which is generally considered to be carried by flies. The houses of the white inhabitants are thoroughly screened, the heads of children are protected by nets when they go out of doors, and even the natives customarily carry branches or fans in their hands to brush the flies away from their heads.

Messrs. Fernow and Howard spoke of the similar carriage of the purulent conjunctivitis, prevalent in Egypt, by house-flies, and Mr. Benton spoke of his personal observations in various countries at the eastern end of the Mediterranean, confirming the opinion that the disease is carried by the house-fly. Mr. Ashmead referred to the probable spread of "sore eye" in Florida by Hippelates.

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* Published in Bull. 10, Div. Entom., U. S. Dept. Agr., pp. 63–65.

Mr. Fairchild, in answer to a question, stated that the Fiji eye-disease in its milder form lasts, in its acute stage, 4 or 5 days and then gradually dies away.

—Mr. Banks read the following paper:

A NEW SPECIES OF THE GENUS HALARACHNE.

By Nathan Banks.

In 1847 Prof. Allman described a remarkable mite which he had discovered in the nares of a seal from the Irish Sea. Unable to place it in any of the then existing genera, he established for it the new genus Halarachne, and named the species *H. halichœri*, after the genus of seal on which it occurred. He characterized the genus as follows: "Palps free, filiform, mandibles didactyle, sternal lip bifid. Legs with last joints terminated by two hooks and an intermediate three-lobed caruncle. Body entire, elongate, subcylindrical, furnished anteriorly with a dorsal plate; eyes none."

He placed the genus in the vicinity of Dermanyssus; a position which I believe to be correct. For many years little or no attention was given the mite. However, in 1884, Nehring, a German mammalologist, obtained specimens from the same seal, and published a note upon it. He maintained that it was related to the Ixodidæ rather than to the Gamasidæ, chiefly on account of its shape, general appearance, and especially the posterior position of the stigmata.

Kramer, the acarologist, saw the specimens and wrote a short article upon the mite, dealing principally with its anatomy. Haller in 1886 gave a few notes upon it. In 1889 Nehring published another note upon it. Its peculiar habitat is, doubtless, the reason why so few specimens have come into the hands of acarologists; and thus the genus has rarely been mentioned or treated in systematic works.

A short time ago Dr. Motter brought me some examples of a mite given him by Dr. Hassall, who took them from the bronchial tubes of a seal that had died in the Zoölogical Park. At first I thought it related to one of Kolenati's genera of bat-mites, viz., Lepronyssus; but soon discovered that it was a species of Halarachne, closely allied to *H. halichœri*. The genera erected by Kolenati in the Dermanyssidæ have not been generally accepted, and there is much uncertainty regarding them. But the great difference in habitat, and doubtless the position of the stigmata, will separate Halarachne from all other Dermanyssidæ. The breathing pore is situate just above the fourth coxa, and a line from it extends around and behind the coxa. In Dermanyssus the stigmata are a little farther forward. The mouth-parts

are, however, chelate, and of the true Gamasid type. The palpi are free, and the other characters do not depart from those of Dermanyssus sufficiently to merit notice. The shape of the dorsal plate and elongate body are rather anomalous, but not characters of importance. I shall therefore consider Halarachne a genus of Dermanyssidæ, not greatly differing from the other members of that family; but showing certain adaptive characters that fit it for its peculiar surroundings.

Our species appears to be different from the European form; and I describe it as follows:

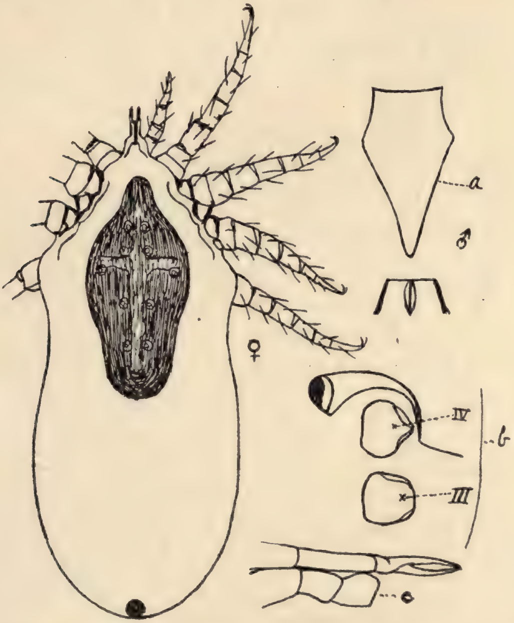

FIG. 15.—*Halarachne americana*: *a*, sternum of male; *b*, stigmata and coxæ; *c*, mandible; all enlarged. (Original.)

Halarachne americana, n. sp.

White, hard parts pale yellowish; smooth, body narrowed in front, contracted behind the fourth pair of legs, broadly rounded at tip; a dorsal shield on basal half, narrow in front, broadest before the middle, then tapering behind, but broadly rounded at tip, showing an irregular cross and some geminate spots; a small round hard spot near tip of body at the anus; legs short and stout, second pair stoutest, with a few short bristles, and two claws at tip, the terminal joint longer than the others which are subequal; stigmata just above the fourth coxæ; sternal plate truncate in front, sides nearly parallel at first, then concavely tapering to the bluntly-pointed apex.

The male (perhaps not quite adult) is smaller than the female, and the abdomen does not extend much beyond the dorsal shield, and is much narrowed behind; the sternal plate is of about the same shape as that of the female, behind it there is a transverse line from each end of which there extends back a short dark line; in the middle is an elongate pointed genital opening.

Length ♀ 2.6 to 2.8 mm.; ♂ 1.8 mm.

Habitat—Bronchial tubes of a seal (*Monarchus tropicalis*).

HALARACHNE Allman.

Ann. & Mag. Nat. Hist., 1847.

H. halichœri Allm.

Ann. & Mag. Nat. Hist., 1847.—Allman.

Sitzungsber. d. Ges., naturforsch. Freunde zu Berlin, 1884, pp. 57-64.—Nehring.

Zeitschr. f. Naturw., 1885, pp. 46-74.—Kramer.

Zool. Anz., 1886, pp. 52-55.—Haller.

Humboldt (Dammer), 1889, p. 315.—Nehring.

Habitat—On *Halichœrus gryphus.*

H. americana, n. sp.

Habitat—On *Monarchus tropicalis.*

Dr. Motter, who had seen the specimens taken from the dead seal, stated that the air-passages were swarming with the mite, which, however, did not appear to have been the cause of the death of the seal.

Dr. Gill suggested that Mr. Banks might, to advantage, exchange the specific name *americana* to *monarchi*, from the genus of the seal in which it was found. He objected to *americana* for the reason that the host of the type species is quite as American as the host of the new species.

Mr. Banks objected to adopting the name *monarchi*, since the genera of vertebrates no less than of arthropods are frequently changed.

—Mr. Ashmead read a paper entitled "On the Genera of the Xyelinæ.* This was a technical paper giving the characteristics of four genera of this group belonging to the fauna of the United States and forming a distinct family Xyelidæ, which he had separated from the Tenthredinidæ. These genera are Xyela,

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* Published in Psyche, May, 1898, p. 214.

Macroxyela, Megaxyela, and Manoxyela. He stated that the larvæ of the group were not known, and that he had been unable to ascertain their habits with certainty, but considered that they were probably borers. He remarked upon the fact that they are found flying in the spring and then disappear for the rest of the year.

Mr. Schwarz stated that many years ago he had been attracted by the beauty of the local species, which occurs in the earliest warm days in the spring. He had found it frequently on the 22d February. It used to occur very abundantly on young pines near Washington, but these trees on being examined later in the season showed no signs of injury.

129

November 4, 1897.

Vice-President Gill in the chair, and Messrs. Uhler, Motter, Patten, Johnson, Banks, Schwarz, Ashmead, Heidemann, Dyar, Benton, Busck, Currie, Pratt, Howard, Cook, Fernow, and Swingle also present. Prof. Dr. K. W. von Dalla Torre, of Innsbruck, was elected a corresponding member.

Under the head of "Short Notes and Exhibition of Specimens," Mr. Ashmead showed specimens of the male of *Pelecinus polyturator*, sent in by Mr. Wyeth, from Indiana, and also specimens of the genus Proterops of Wesmael, a Braconid parasitic upon saw-flies, which is remarkable in that the middle ocellus is placed between the bases of the antennæ. Mr. Schwarz spoke of the abundance of Pelecinus in Detroit during the past summer. He had noticed them flying in numbers along the streets lined with maple trees, and thought perhaps they might be parasitic upon the common maple-borer, *Ægeria acerni*. Mr. Ashmead, however, had told him that it is more likely to be parasitic upon a Coleopterous borer. Mr. Ashmead stated that the species has a very wide distribution, occurring from Canada to Argentina. He thinks it to be a very ancient form allied to the Proctotrypidæ, and to a group of the Proctotrypidæ which is always parasitic upon Coleopterous larvæ. Prof. Uhler said that this species used to be common near Baltimore, and that he had once or twice caught the male. In a low spot of ground thickly covered with an undergrowth of black alder and spice bush,

and containing oaks and maples, the insect was particularly common.

—Mr. Banks showed a female of *Meleoma signoreti* Fitch, a rare lace-winged fly which he had collected on Long Island. A new species of this genus had been sent in by Mrs. Slosson, which he had named after her. Mr. Ashmead remarked that Fitch's type of this species is in the National Museum. Prof. Uhler said that he had received specimens from Illinois.

—Mr. O. F. Cook exhibited specimens of *Peripatus novazealandicus* from New Zealand, and two small species of Peripatus from the Bismarck Archipelago. He also exhibited a Dyscritina from Liberia. A discussion as to the zoölogical position of Peripatus ensued between Messrs. Gill and Cook.

—Mr. Schwarz exhibited a specimen of *Cychrus mexicanus* Bates, a species new to the fauna of the United States, which Mr. Hubbard had found at Cave Creek, in the Chiricahua Mountains of southern Arizona. He spoke of the habits and distribution of the genus Cychrus in the United States.

—Mr. Howard exhibited specimens of *Trypeta acidusa* Walker, which had been reared from ripe peaches by Mr. Koebele at Orizaba, Mexico. Incidentally he spoke of the Mexican distribution of *Trypeta ludens*. Mr. Johnson said that it would be important to investigate the possible shipping of peaches from Mexico to the United States in order to prevent the introduction of this new pest. Mr. Uhler said that he thought he had seen the same species in San Domingo.

—At the request of the Chairman, Mr. Swingle spoke briefly of an undetermined mite which he had found feeding upon the mold occurring in spots upon the bindings of books in one of the rooms of the National Museum.

— Prof. Uhler exhibited a series of species of American Notonectas, which had been named by Mr. G. W. Kirkaldy, of Wimbleton, England. He spoke of Mr. Kirkaldy's excellent work upon this group, and indicated some structural peculiarities of the genus and its remarkable distribution in America. One species, for example, he said, is found from Rio Janeiro to Quebec. It results from Mr. Kirkaldy's studies that we have in America nine valid species of the genus.

—The first paper of the evening was by Mr. Heidemann, and was entitled :

HETEROPTERA FOUND ON OX-EYE DAISY (CHRYSANTHEMUM LEUCANTHEMUM).

By Otto Heidemann.

It is generally known that the common ox-eye daisy (*Chrysanthemum leucanthemum*) has a great attraction for many of our insects. The plant flowers from early May until late in July. It grows so profusely on some fields that, seen from the distance, they appear to be snow-covered. In sweeping such fields early in May, I was greatly interested in finding *Leptopterna dolabrata* Linn., a European species of the family Capsidæ, in very great numbers, and in all stages of development. They are hardly to be detected on the plant, as the larva and pupa resemble in coloration the stem and leaf. Thus it seems probable that *Chrysanthemum leucanthemum*, which is a native of the Old World, may be the food-plant of this common Capsid. Unfortunately I was unable to find the eggs in spite of careful research. In former years I had noticed the appearance of the insect regularly on the same plant, but never did it occur so plentifully as at this season. This common Capsid has probably two broods, because I found the young larva very early in May, and also in the month of July. After this the insect disappears in our locality. Besides this one species, I met with other heteropterous insects on the daisies, which are either attracted by the color of the flower, or visit the same in search of prey, as I found to be the case with *Triphleps insidiosus* Say and *Phymata fasciata* Gray, both hiding between the petals of the flower. I swept quite frequently during the months of May and June, and until late in July, when the daisies began to wither. As a result of my collecting I can record the following species of Heteroptera :

Neottiglossa sulcifrons Stal.
Œbalus pugnax Fab.
Hymenarcys nervosa Say.
Trichopepla semivittata Say.
Harmostes reflexulus Stal.
Corizus lateralis Say.
Corizus nigristernum Sign.
Nysius angustatus Uhl.
Cymus angustatus Stal.
Jalysus spinosus Say.
Leptopterna dolabrata Lin.
Collaria oculata Reut.
Lygus pratensis Lin.
Oncognathus binotatus Fab.
Pœciloscytus basalis Reut.
Calocoris rapidus Say.
Agalliastes suavis Reut.
Stiphrosoma stygica Say.
Halticus uhleri Giard.
Episcopus ornatus Reut.
Oncotylus decolor Fall.
Apocremnus robustus Uhl. MS.
Triphleps insidiosus Say.
Phymata fasciata Gray.
Coriscus ferus Lin.
Coriscus punctipes Reut.
Sinea diadema Fab.

In discussion Mr. Ashmead asked whether, besides the European *Leptoterna dolabrata*, any of the species listed by Mr. Heidemann were especially addicted to the plant, or whether they are accidental visitors. Mr. Heidemann replied that some of the other Capsids mentioned may possibly be found to breed on the ox-eye daisy. Prof. Uhler said that the eggs of the Capsids are very difficult to find, so that it is frequently almost impossible to determine the breeding plant of a species. Mr. Schwarz said that, the ox-eye daisy being an introduced plant, nearly all of the insects mentioned must have other original food-plants. He referred to the European Chenopodiums introduced into this country, which afford breeding places for many of our native insects. Attention was called to the fact that the Phymata listed by Mr. Heidemann seeks yellow flowers for concealment while capturing its prey.

—Dr. H. G. Dyar presented the following communication:

SOME STRUCTURAL POINTS IN SAW-FLY LARVÆ.

By Harrison G. Dyar, Ph. D.

The larvæ of the leaf-feeding Hymenoptera are slender, eruciform insects, closely resembling in general character the larvæ of the Lepidoptera. The head is round, with a single ocellus on each side, a shield-shaped, not triangular, clypeus without side pieces; large labium and distinct antennæ situated below the ocellus, higher up than in the Lepidopterous larva. The body has the same number of segments as in the Lepidoptera; thoracic feet usually strong and more distinctly functional than the abdominal ones. The latter are weak, without terminal retaining hooks or crotchets, and are present in varying number. There are two well-marked series; one with abdominal feet on segments 2 to 7 and 10, the other on segments 2 to 8 and 10. In a few there are no abdominal feet. The body segments are usually marked by a series of transverse creases, forming subsegments or annulets. The primitive number seems to be three, but they may be increased by the folding off of additional annulets, usually at each end of the segment, at the incisure. The original annulets themselves are seldom divided. Below the spiracles there is a longitudinal ridge, usually divided into two portions, an upper anterior and lower posterior. The three original annulets and the subventral ridge bear a series of short setæ, about three on each side on each annulet, the exact number varying. These setæ are small, simple ones, often greatly reduced, seldom modified. The

only peculiar form is the large, furcate spine of some of the Blennocampids. These are never true warts. Occasionally there may be other fine hairs scattered over the skin. The setæ are distinctly variable in number, as just stated, even in closely allied forms, and it is somewhat surprising to find them not possessed of anything like the fixity or constancy of the primary setæ of the Lepidopterous larva. They correspond in their modifications rather to secondary hairs, and it may be stated that primary setæ, as that term is understood in Lepidoptera, are not present in the larvæ of Tenthredinidæ. Consequently they are of much less value in the broad lines of classification, and it is interesting to see what, at first sight, appears the same character of such different value in the two groups of insects. As compared with the Lepidopterous larva, the saw-fly is much generalized. In the shape of the clypeus and position of the antennæ it shows less divergence from the mature insect. The thoracic feet are predominant, and the abdominal ones are simply membranous pads. The hair structures are very simple. The smooth skin but rarely bears processes, which do not exceed the simple papilla in complexity. Eversible glands, however, may be present, either ventrally or laterally, and the skin may secrete a pruinose or long woolly coating. The coloration is of the simplest. The skin is usually transparent, and the larva receives its color from the green blood. The lines consist of the outlines of the dorsal vessel and tracheal line, supplemented by fat granules. Spots are formed by black pigment, often at the setæ, but the deposition of pigment is seldom extensive, never complicated. Mimicry of special objects other than the leaves it feeds on is rarely attempted by the larva. I have in mind two cases, one from the Nematinæ, the other from the Tenthredininæ (neither larva bred), where the excrement of birds is mimicked. One or two others are somewhat brightly colored.

I should like to present a classification of saw-fly larvæ, based on the characters just reviewed, but my material is too scanty. When our species are better known it may be possible to do this. In the meantime I will indicate some of the differences between the different groups as seen in a few examples.

Hylotominæ.

Hylotoma macleayi.—No feet on segment 8 ; segments divided into three annulets, each with three tubercles above the tracheal line ; a large oblique subventral ridge with many setæ.

Nematinæ.

Nematus ribesii.—No feet on segment 8 ; segments divided into three annulets, each with three tubercles, the anterior ones sometimes partly wanting ; a small cluster of hairs on subventral ridge.

Hemichroa americana.—Feet present on segment 8; segments indistinctly divided into 6 annulets, one cut off before, two behind the primitive setiferous annulets as in the Tenthredinidæ.

On larval characters, this species clearly does not belong to the Nematinæ.

CIMBICINÆ.

The characters are, in general, as in the Tenthredininæ. I cannot give details at the moment of writing.

Acordulecra dorsalis.—No feet on segment 8; segments divided into three annulets, each with three tubercles above the tracheal line, except on the anterior annulet, where the middle one is missing; very indistinct tubercles on subventral ridge.

This larva is evidently allied to the Hylotominæ, not to Cimbex.

TENTHREDININÆ.

Blennocampa spirææ.—Feet on segment 8; segments divided into five annulets, one cut off before and one behind the three primitive setiferous annulets, which bear three rudimentary spines above the tracheal line, except the middle annulet, where only one is present low down. A group of spines on each division of the subventral ridge.

Siobla excavata.—Feet on segment 8; segments divided into six annulets, one before, two behind the primitive annulets, which bear fine points, except the middle annulet, where only a few are present low down.

PAMPHILIINÆ.

Lophyrus lecontei.—Feet on segment 8; segments divided into six annulets, two cut off behind the last primitive setiferous annulet, and one cut off behind the second, the original setæ thus present on annulets 1, 2, and 4, numerous, developed alike on all; a group of setæ on each division of subventral ridge.

Pamphilia ochreata.—No feet; a pair of jointed anal appendages. Segments divided indistinctly into four annulets; no perceptible setæ.

XYELINÆ.

No larvæ seen by me.*

I have some other striking modifications of structure, but the larvæ are not yet bred, so I do not know the significance of them.

Mr. Ashmead congratulated the speaker upon this work, and said that he considered it of great importance. The annulets and

* These larvæ have since been discovered. See Psyche, VIII, 213; Can. Ent. XXX, 175, and XXXI, 41.

tubercles were never before made use of in systematic work, and he felt sure these would be found to be of great taxonomic significance.

— Mr. Banks presented the following paper:

AN AMERICAN SPECIES OF THE GENUS CÆCULUS.

By Nathan Banks.

In every group of animals there are a few genera having characters which ally them to various larger groups, or serve to conceal their true relationship. In the Acari there are several such genera, and not least interesting of them is Cæculus. Its general appearance at once reminds one of certain Oribatid mites, viz., Nothrus. And on a closer examination one finds several structures which would confirm this appearance. But there are certain characters, deemed by acarologists of much importance, which place the mite near a quite different family, the Trombididæ. These important characters are the palpi, the structure of the coxæ, and the peculiar eyes. The eyes are almost exactly as in Trombidium, an arrangement not found elsewhere in the Acari. But the dorsal shields, the rough spinose legs, and the large ventral openings are characters wholly foreign to the Trombididæ.

The early writers placed the genus after Oribata, and Gervais suggests that it has some affinity with Phalangium. In 1877 Canestrini and Fanzago wrote a paper on the genus and erected for it a new family, which they placed near the Trombididæ. This position it has since occupied in all classifications. Canestrini and Fanzago gave the genus a new name, Hoplopus; because they thought Cæculus inappropriate, and called the family Hoplopidæ. But since Hoplopus is a synonym, the family should be called Cæculidæ.

The genus is represented in southern Europe and northern Africa by one species, *C. echinipes*. Last spring Mr. H. G. Hubbard sent me a mite taken at Palm Springs, California. It proves to belong to Cæculus, and differs from the typical European species in several minor particulars.

Cæculus americanus, n. sp.

Length 1.3 mm. Black, soft portions rather reddish-brown. Cephalic shield more than twice as long as broad in front, twice as broad behind as in front, sides sinuate, angles rounded; from the front margin there projects four spatulate hairs or scales; there are two subparallel middle lines not reaching to the hind margin; under the hind angles arise a double tubercle, each bearing an eye. Anterior shield of the abdomen one-

third broader behind than in front, rather concave above, traversed by irregular low ridges, and two longitudinal lines rather nearer to the lateral margin than to the middle. Posterior abdominal shield much broader than anterior, its front border concave, broadly rounded behind, bearing above two scale-like hairs on the front border, four in a transverse line beyond the middle, and four more on hind border. Venter with large anal and genital openings close together. Legs very large and stout, first pair longest but plainly shorter than body, all roughened and clothed with clavate hairs, two on the front magin of the anterior trochanters are larger, spatulate and curved. The first leg is armed with stout erect, slightly curved spines, longer than the widths of the joints, two on the inner border of femur, three on the inner border oı tibia, five on inner border of metatarsus; rather smaller and more curved ones on the lower outside margin of these joints. Palpi not very long, bristly.

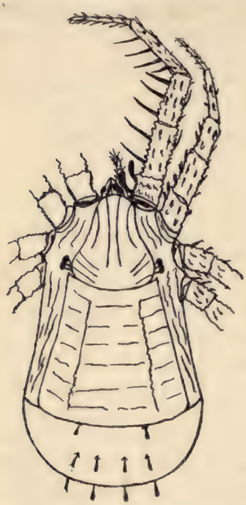

Fig. 16.—*Cæculus americanus*; enlarged. (Original.)

Two specimens collected by Mr. H. G. Hubbard, at Palm Springs, California.

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Dufour, L. Descript. and figure of Cæculus echinipes. Ann. des Sci. Nat., XXV, 1832, p. 289, pl. 9, figs. 1–3.
Gervais, P. Aptères, III, p. 260, pl. 38, fig. 5.
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Berlese, A. Acari ital.—Prostigmata, pl. 50, fasc. 50.

— Mr. O. F. Cook presented the following paper:

NEW DICELLURA.

By O. F. Cook.

The genus Japyx Halliday has been recognized* as a distinct order under the above name. To the Japygidæ is to be added a new family, Projapygidæ, founded on *Projapyx stylifer*,† a new

* Brandtia, p. 49, July, 1896. In October of the same year Mr. Ashmead published the name Uratochelia for the same group in Volume III of these Proceedings, page 327.

† See plate II, figs. 5a–5d.

species recently collected in the undisturbed humus of dense tropical forest at Mt. Coffee, Liberia. The habit is that of Japyx, the most conspicuous difference lying in the possession of a pair of jointed stylets instead of the caudal forceps. The abdominal legs are the same in number and location as those of Japyx, but differ in being of delicate structure and in bearing several hairs, one of which has a distinctly thicker base and is slightly curved; it is attached in a manner which warrants the suspicion that it may represent the claw. The antennæ have about twenty (18–23) joints, which are shorter and proportionately broader than those of Japyx. The legs, mouth-parts, and cephalic sclerites are those of Japyx throughout, but the head is not so square in front as in Japyx, being narrowed so as to be somewhat triangular in general shape. The last segment is short and broad, the long and strongly chitinized terminal sclerite of Japyx being evidently a specialization necessary to make the forceps effective.

In color the living insects were pure white or slightly creamy, sometimes slightly discolored by the dark contents of the alimentary canal. There was considerable difference in size and length of stylets, probably due to age. My largest specimen is about 3.5 millimetres long, not including antennæ or stylets, the latter being about .7 of a millimetre long, the former one millimetre. The habits and movements are so exactly those of Japyx that the first specimen was pursued as an early stage of that form. Several specimens were collected, though it was far less common than Japyx or Campodea in the same habitat.

The jointed stylets might be taken as indicating relationship with Campodea rather than with Japyx, but the approximation to the latter in the characters mentioned above is against such an inference, and the stylets, when examined more closely,* appear quite as different, to say the least, from those of Campodea as from those of Japyx. In the former type they are very long and slender, being composed of numerous joints several times longer than broad, each with several whorls of barbed hairs. The articulation of these rod-like stylets is rather imperfect. They are only slightly flexible and very fragile. The stylets of Projapyx, on the contrary, are composed of 10 distinct joints, of which all except the last bear two whorls of long, simple hairs. The last joint has as a distal projection a narrowly conic, truncated, transparent and rather faintly chitinized structure which may be a modified claw or sense-organ, nothing comparable appearing on the stylets of Campodea.

This new form may perhaps claim the distinction of being the most primitive insect yet known, since both Japyx and Campodea are somewhat more specialized. Whether it should be looked

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* Plate II, compare figs. 5a and 5b with 6a.

upon as a connecting link between Japyx and Campodea cannot be decided until its internal anatomy has been studied, the internal differences between Japyx and Campodea being much greater than the external.

Supposing that the stylets of the forms under discussion are in reality legs, Japyx must have been preceded in evolution by some such type as the present. The analogy of the anal legs of Chilopoda gives support to this view, and the presence of a possible claw on the stylet of Projapyx enforces its claim to distinction as the most primitive insect. The functions of the stylets of these and many other hexapoda, such as the Thysanura and Embiidæ, are, no doubt, at least two. They support the abdomen, and are tactile organs, giving warning of danger from the rear. The multiplication of joints beyond that of normal legs is paralleled in the Chilopoda in the genus Newportia, which is indubitably a near relative of forms having anal legs with well developed claws and a normal number of joints.

New Species of Japyx.

About twenty supposed species of Japyx have been named, of which very few are identifiable from the descriptions, these being rendered useless partly from a lack of sufficient attention to details, but chiefly because the number of specimens available for study has, in most cases, been so small that the formulation of any criteria of specific diagnosis and variability was not possible. Indeed, a far larger amount of material than is known to be available in the museums of the world would probably be necessary as a basis for a satisfactory classification of this neglected group. A preliminary examination of over a hundred specimens, nearly all of my own collecting, seems to indicate that there are geographical races or species distinguishable by the form and armature of the forceps, the demonstrated utility of other characters being very slight. The form and relative proportions of the forceps differ but slightly throughout the group. In all cases there is a distinct asymmetery, the two arms of the forceps never being exact counterparts, although the inequality is much more pronounced in some species than in others. Both arms are normally beset along their mesial edges by a row of denticules, with one conspicuous tooth located at or below the middle. Distad from these large teeth the denticules are nearly always arranged in a single row along the edge, while below the large tooth there seem to be normally two rows of usually rounded and flattened tubercles separated by distinct spaces. Accordingly, for convenience in description, the large process may be called simply the "tooth," those distad from it the "denticules," those proximad the "tubercles," while these last are "superior" or "inferior," according to position. The size, number, and arrangement of these basal

tubercles appear to furnish characters of systematic utility greater than the denticules beyond the tooth, which in nearly all cases decrease in size distad so gradually that their number is a matter of uncertainty, and appears subject to considerable variation.

The identification of immature specimens is likely to be always a matter of difficulty, especially if unaccompanied by adult material. Very young individuals have the forceps slender, equal, and almost or quite without armature, which, with the asymmetry and other peculiarities of the adult, is acquired gradually.

Left arm of forceps without tubercles; tooth located far below the middle; denticules few (4–5) and small, but arranged in two rows: *J. athenarum, sp. n.*, Athens, Berlin Museum. (Plate I, figs. 1a–1b.)

Left arm with few to many (3–20) tubercles usually arranged in two rows; tooth in nearly all cases located at or near the middle; denticules in a single row..

Right arm with a single continuous row of about twenty small teeth, none of which is conspicuously larger or more prominent than the others: *J. hubbardi, sp. n.*, Chiricahua Mountains, Arizona, U. S. Nat. Museum. (Plate I, figs. 2a–2b.)

Both arms of forceps with one or two conspicuous teeth or nodiform prominences..

Right arm with a large, smooth and even sinus below the tooth, then with an abruptly prominent nodiform process or second tooth which frequently shows signs of being composed of three coalesced tubercles; superior row of one or two small, though distinct, tubercles: *J. bidens, sp. n.*, Alabama, U. S. Nat. Museum. (Pl. I, figs. 3a–3b.)

Right arm with the sinus which separates the tooth from the first tubercle of the inferior row inconspicuous, or at least not as broad as the base of the tooth; without a conspicuous abrupt process formed of coalesced tubercles; superior row various..

Right arm of forceps with four or five distinct, subequal tubercles in the inferior row; superior row wanting; left arm distinctly narrower and straighter, remaining nearly as narrow for some distance below the tooth as for some distance above it; the proximal sinus beset with about 20 distinct, spaced tubercles arranged in two subequal rows; tubercles not decreasing in size proximad: *Japyx multidens, sp. n.*, Alabama, U. S. Nat. Museum. (Pl. I, figs. 4a–4b.)

Right arm with one or two tubercles, or the tubercles in two rows; superior row represented by at least one distinct tubercle; left arm not conspicuously straighter than the right, if narrower than the right it is distinctly broader immediately below the tooth than above it; tubercles less distinct, less numerous, and decreasing in size proximad..................

Right arm of forceps in adult specimens with the proximal edge of the

tooth nearly transverse, leading into a deep and distinct sinus followed proximad by two indistinct, broadly rounded, subcoalesced tubercles, with a single distinct tubercle in the upper row (Plate I, figs. 5a–5b); younger forms have the forceps more slender, the teeth smaller, the tubercles smaller, more distinct, and sometimes more numerous so that there may be three, or very rarely four, contiguous in each row (Plate I, figs. 6a–6b); *Japyx liberiensis*, *sp. n.*, Western Liberia, type in U. S. Nat. Museum.

Right arm in adults with proximal edge of tooth distinctly sloping; no conspicuous sinus immediately below the tooth, usually with an evenly curved general sinus, similar to that of the left arm; tubercles mostly more numerous, spaced as on the left arm........................ ....

Right arm of forceps with a single dentiform tubercle; left arm without denticules beyond the broadly triangular tooth: *J. creticus*, *sp. n.*, Crete, Berlin Museum. (Pl. II, figs. 1a–1b.)

Both arms with numerous and distinct tubercles and denticules; teeth distinctly convex on the distal edge.. .....

Right arm maintaining its width to the tooth, beyond which it is somewhat abruptly narrowed by an oblique edge armed with very distinct rounded denticules: *J. obliquus*, *sp. n.*, Liberia, U. S. Nat. Museum. (Pl. II, figs. 2a–2b.)

The two arms very similar in size and shape, distinctly narrowed from near the base; both sinuses evenly curved like the left arm of the last species..................... ....

Forceps slender; teeth located somewhat below the middle; denticules small and indistinct: *J. javanicus*, *sp. n.*, Java, U. S. Nat. Museum. (Pl. II, figs. 3a–3b.)

Forceps robust; teeth located well above the middle; denticules fewer, large and distinct: *J. africanus* Karsch, Togo Colony, Berlin Museum. (Pl. II, figs. 4a–4b.)

Explanation of Plate I.

The figures are camera tracings of the ventral aspect of the forceps. In some cases the outline of the superior row of tubercles has been placed upon the drawing opposite that of the lower row. The figures are not drawn to a uniform scale, which would have resulted in some being too small to make the armature visible, or others would have occupied an entire plate.

Figs. 1a–1b. Right and left arms respectively of the forceps of *Japyx athenarum*.
2a–2b. Same of *J. hubbardi*.
3a–3b. *J. bidens*.
4a–4b. *J. multidens*.
5a–5b. *J. liberiensis*.
6a–6b. *J. liberiensis*, a younger stage.

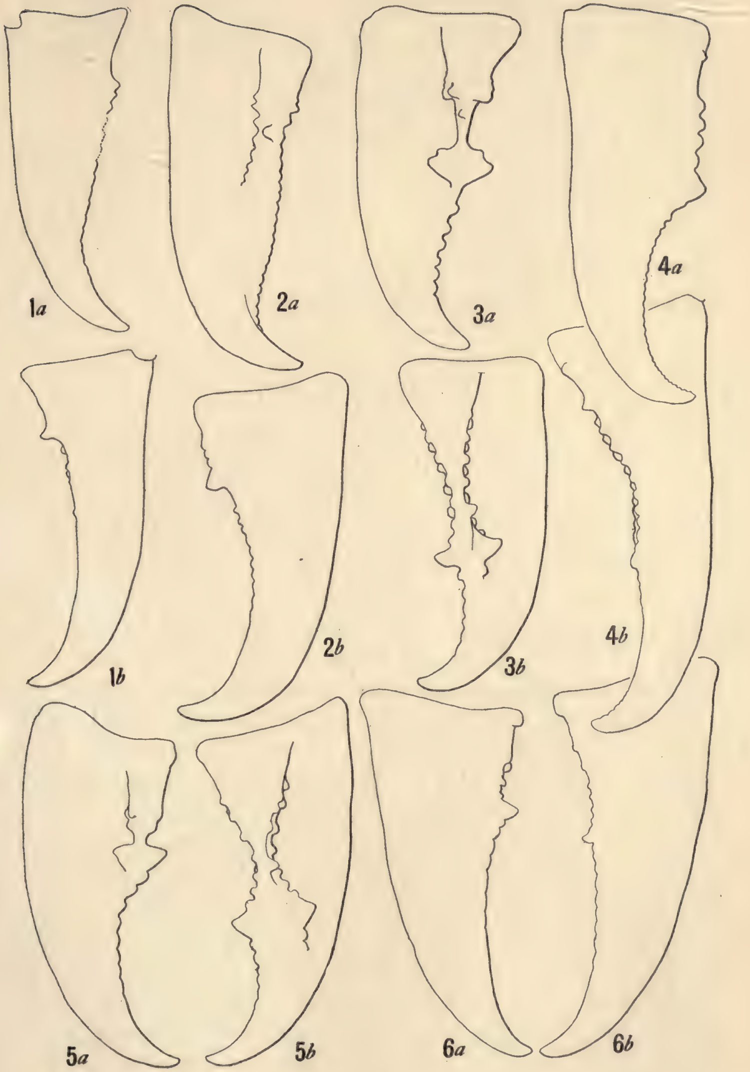

PLATE I.

Explanation of Plate II.

Figs. 1a–1b. *J. creticus.*
2a–2b. *J. obliquus.*
3a–3b. *J. javanicus.*
4a 4b. *J. africanus;* the outline of the superior tubercles being somewhat more magnified.
5a. Stylet *Projapyx stylifer.*
5b. Six terminal joints of same, more magnified.
5c. Abdominal leg.
5d. Five distal joints of antenna.
6a. Four distal joints of stylet of *Campodea sp.* from Grand Canary.
6b. Five distal joints of antenna of same.
7a. Two distal joints of antenna of *Japyx multidens.*

130 December 2, 1897.

Vice-President Gill occupied the chair, and the following members were also present: Messrs. Johnson, Benton, Schwarz, Heidemann, Busck, Dyar, Pratt, Motter, Hubbard, Ashmead, Howard, Cook, Currie, Swingle, Stiles, and de Schweinitz, active members, and Messrs. Greeley and Sherman, visitors. The following new members were elected: active—Dr. F. C. Kenyon; corresponding—Mrs. Annie Trumbull Slosson, New York, and Mr. R. J. Weith, Elkhart, Ind.

Officers for the year 1898 were elected, as follows:

President, Mr. Henry G. Hubbard; First Vice-President, Dr. T. N. Gill; Second Vice-President, Dr. H. G. Dyar; Corresponding Secretary, Mr. Frank Benton; Recording Secretary, Dr. L. O. Howard; Treasurer, Mr. E. A. Schwarz.

Additional members of Executive Committee: Mr. C. L. Marlatt, Mr. Wm. H. Ashmead, Mr. F. H. Chittenden.

— Under the head of "Short Notes and Exhibition of Specimens," Mr. Hubbard exhibited specimens of *Dinapate wrightii* in all stages. He had found the larva of this remarkably rare beetle boring in the trunk of *Washingtonia filifera* at Palm Springs, Cal., and the adults had been reared at the Department of Agriculture at Washington. He described the method of work and said that he considers this interesting species to be on the point of extinction. He called it the Dodo of beetles.

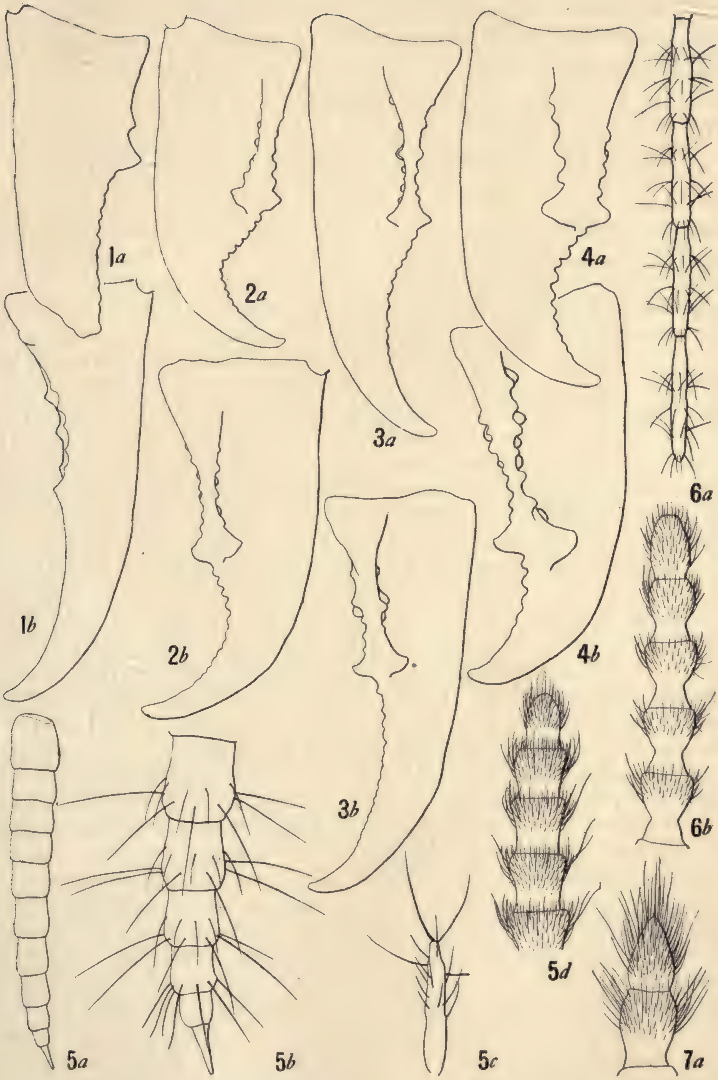

PLATE II.

Mr. Schwarz said that Dr. Horn's original description and figures were made from fragments only. He thought the specimen exhibited was the first perfect specimen ever seen. Mr. Pratt remarked that there are two specimens of this species in the British Museum.

— Mr. Johnson read the following paper:

ISAAC P. TRIMBLE, ECONOMIC ENTOMOLOGIST.

By W. G. Johnson.

Isaac P. Trimble was born in 1802, of Quaker parentage, and was educated for a surgeon. He was for a time connected with the Pennsylvania Hospital for the Insane, where he was associated with Dr. Kirkbride, an eminent surgeon, in delivering a course of lectures. Leaving Philadelphia in 1840, he went to New York city, where he afterwards married, and continued his practice as a surgeon until 1846. He then purchased a farm, beautifully located on the Hudson River, near Cheviatt, and moved with his family to that place. Here he became greatly interested in fruit culture, and, as a natural consequence, on account of his interest in original investigation, also in the insects that affect fruit trees. He remained on this farm for about ten years, raising and marketing fruit of a superior quality, an enterprise which he found delightful and profitable. In 1856 he moved with his family to Newark, New Jersey, to assume his duties as an officer in the Custom House, a position which he held until 1873. It was during this time that much of his original entomological work was accomplished, outside of his regular official duties. In 1873 he retired from active business and professional work, residing almost continuously in New York city until 1887. During this period he travelled considerably, especially through those sections where fruit-culture is prominent. The last two years of his life were spent at a beautiful country residence near Cornwall on the Hudson, where he died in September, 1889, at the age of 87.

Trimble's passion for outdoor life seems to have increased as his age advanced, as it was almost impossible to keep him from taking long strolls into the woods and ravines alone during the last two years of his life, even when he was physically unable to do so. His eyesight was keen, and he could read a newspaper, even of the finest print, without the aid of glasses, after he had passed his eighty-fifth birthday. He was wrapped up in nature, and lived almost entirely in the orchards and fields, with fruits and flowers, birds and insects. He was always the first to note the first opening bud or blossom, heard the first chirp or song of the returning bird, and saw the first insect of spring take flight.

In fact, it was a pleasure for him to predict these happenings a day or two in advance with unerring accuracy.

Although a man who observed much and recorded many facts, he published very little. In the bibliography of the published writings of American economic entomologists we find recorded but nine papers which Trimble was known to have published. The most important of these was his treatise on the Insect Enemies of Fruit and Fruit Trees, which he dedicated to the farmers and fruit-growers of America in 1865.

He had studied these enemies for many years, and at first it was an investigation made necessary for the protection of his own crops. From this experience he ascertained many facts that he had not been able to find in books or cabinets. The interest thus excited was increased by the reading of the valuable works of Kirby and Spence, Huber, Latreille, Say, Harris, Fitch, and many others. From this reading and personal experience, Trimble felt satisfied that the interests of all fruit-growers would be promoted if the practical knowledge on this subject could be gathered into a separate work; and he felt it his duty to make a beginning by contributing his portion.

He maintained that any individual could subdue his fruit enemies if he chose, and all that was necessary to accomplish this object was to adopt some general plan of treatment. His first work, therefore, was a review of personal experiences with the plum curculio and codling-moth, or apple-moth, as he called it, two insects that had been conspicuously abundant in his orchard, both of which he conquered by persistent and energetic warfare. He believed that a work to be of much practical value to the average fruit-grower must be profusely illustrated. He therefore secured the services of the talented artist, Hochstein, of New York, who came to his house in order that the drawings might be personally supervised. Trimble's first volume contained eleven plates, eight of which were richly colored. Careful and minute descriptions of these plates followed each, and it must be conceded that he spared neither time nor money in making his work intelligible by addressing his illustrations to the eye. His specimens were carefully selected and beautifully arranged on his plates.

As soon as he determined on the preparation of his book he began a systematic investigation upon the time of the appearance, the habits and the depredations of the various insect pests that came under his observation, and noted every evening what he had seen during the day. During the season of 1864, he says, "this diary made many volumes." That portion relating to the curculio and codling-moth has been incorporated in his published work, but, unfortunately, so far as we are aware at present, the other notes have been lost.

It was Trimble's intention to have followed the first part of his work with another upon the various caterpillars which injure fruit trees and grape vines. For some unknown reason this second part was never published, although the plates were prepared and engraved. It has been my good fortune recently to obtain possession of these unpublished plates through the courtesy of his daughter, Mrs. Shaw; and it is a great pleasure for me to have the opportunity of presenting them for the inspection of the members of this Society.

The plates intended for the second volume are numbered, consecutively, from 12 to 28, making a total of 17, all of which are beautifully arranged and contain much of interest to the economic entomologist. He departed somewhat from the plan he used in his first publication, in that he has illustrated the principal natural enemies of the insects he had under discussion. The predaceous and parasitic insects, together with the principal insectivorous birds, are all beautifully delineated and arranged on these plates. They are all the more valuable from the fact that all the plates, except four, contain an explanation in Trimble's handwriting, as the original manuscript which should have accompanied them seems to have been lost. I am also informed by Mrs. Shaw that one lot of the stone plates from which the engravings were made were used for filling up a cistern. One lot of these plates is still in existence, and it is barely possible that they may prove to be those of the unpublished plates presented here to-night.

I also have in my possession a lot of unpublished drawings which Trimble had executed during the sixties. These drawings are of various insects and their work, all of which are of economic importance. He seems to have contemplated the publication of still a third volume, and it would appear from these drawings that had such a publication appeared, it would probably have been upon plant lice, and possibly the knot affecting plum and cherry. I also find in this collection a proof-sheet from an engraving of the asparagus beetle (*Crioceris asparagi*), which is of considerable interest, as it seems to have been one of the very first drawn and engraved, showing this insect in all stages of development, after its introduction into this country. I have also nine unfinished drawings, bearing dates from 1862 to 1864, upon plant lice and their work, the curculio, the oyster-shell bark-louse, and several leaf-eating insects upon grape.

If it is remembered that the work which Trimble did was done as a pleasure and recreation, we are somewhat surprised that he should have accomplished as much as he did in an almost unknown field of original investigation. What he did was done single-handed; and that he spent a considerable sum of money for artistic work and engraving cannot be doubted.

In view of these facts, we must admit that Isaac P. Trimble

was a keen observer, a careful recorder, a close student of nature, and that the work he did in his day along entomological lines, alone and unaided, entitles him to a prominent place with the early economic entomologists of this country.

In this connection, Mr. Johnson exhibited three photographs of Mr. Trimble taken at different ages, and a large series of unpublished plates prepared, under Trimble's direction, for the second volume of his work on fruit insects. The plates excited considerable interest from their excellence.

Mr. Schwarz pointed out that some manuscript determinations on the margins of the plates were in the handwriting of the late Professor Riley, and placed the date at which the notes were made at some time between 1872 and 1875. Mr. Schwarz further stated that most of the figures of insects, while carefully drawn, did not possess the characteristic appearance which the Germans call "Habitus."

Mr. Ashmead called attention to the fact that a special effort had been made by Dr. Trimble to have the natural enemies of the injurious insects figured. He said that he could at once name several of the parasites from the figures. There was some doubt as to the date of the preparation of the plates, and Mr. Schwarz pointed out that *Lema trilineata* was figured as "the potato-beetle," showing that the plate must have been prepared before the eastern advent of the Colorado potato-beetle—that is, prior to 1871.

— Dr. Dyar presented the following note:

NOTE ON AN EXTERNAL FEEDING HYMENOPTEROUS PARASITE.

By Harrison G. Dyar, Ph. D.

The larva of a nematine saw-fly occurs commonly on the black oak on Long Island, N. Y., in June (larva marked 8 H in my notes*). They normally rest on the edge of the leaf, feeding almost continuously, and move the abdomen somewhat actively if disturbed. A few were found in an entirely abnormal position, holding on firmly to a rib on the back of the leaf, the abdomen hanging down flaccid. They were quite paralyzed, the dorsal vessel

* The flies proved to be *Numatus chloreus* Nort. The larva is described in Journ. N. Y. Ent. Soc., VI, 123.

not in motion, yet they adhered by the feet more firmly to the leaf than in the healthy condition. On each larva were two eggs of a parasite, rather large, elliptical, pale orange eggs, placed transversely on the venter. Several larvæ were placed in a vial June 8th. The eggs soon hatched. June 11th there were two elliptical smooth green maggots, motionless, the head applied to the saw-fly and sucking its blood. Slightly corrugated by the incisures, otherwise smooth, flattened on the ventral side where they rest on the host. No perceptible substigmatal ridge. Head rounded, distinct, a large black patch on each lobe and one on the clypeus, forming a trilobate mark. Length 1.7 mm. June 12th they were 4 mm. long, dark gray-green, the sides above and below the tracheal line dotted with white by transparency; shape elliptical, the tail a little produced and narrowed. They crawled forward on the host and applied themselves in a new place. In the afternoon the host had turned black and the parasites also, but they had not increased in length. June 13th they left the saw-fly larva and spun cocoons in the corners of the vial.

Mr. Ashmead has determined the parasite as a species of *Pammicra.*

This note was briefly discussed by Messrs. Ashmead, Busck, Stiles, and Howard. Mr. Ashmead said that this was the first instance of an external feeding parasite on a saw-fly larva which he had known, except one recorded in the note-books of the Division of Entomology and afterwards published by himself under the name of *Catelytus pallipes.* He knew of no published instance of paralysis of a larva resulting from the sting of a terebrant hymenopterous parasite.

Mr. Busck remarked that the Proctotrypid *Lælius trogodermatis* paralyzes the larva of the Trogoderma by stinging it before it lays its eggs. Dr. Stiles inquired whether the parasite always stings the larvæ in the same place, suggesting that if this were the case the paralysis was mechanical; if not, that it was probably chemical. Mr. Busck replied that the Lælius always stings the Trogoderma larva at about the base of the third pair of legs, holding itself in a transverse position and inserting its ovipositor under the body of the host larva, thus evidently piercing the third thoracic ganglion. He said that the parasite would generally wait nearly half an hour after stinging the Trogoderma larva, to see whether the operation had been effective, and if so, would then lay its eggs upon the paralyzed body. He had noticed that

although incapable of motion after being thus stung, the Trogoderma larva could still void its excrement.

— Mr. Ashmead read the following paper:

ON THE GENERA OF THE EUCHARIDÆ.

By William H. Ashmead.

In my paper entitled "Notes on the Eucharids found in the United States," read October, 1892, I wrote: "Since becoming better acquainted with that great complex of the Hymenoptera at present known to us under the family name *Chalcididæ*, I have gradually come to the conclusion that instead of a single family to deal with we have several distinct families. Indeed, in many cases, these families are even more distinct and sharply defined than many others of the so-called families in this order, and until these are properly separated and defined, I believe but little real progress can be made in our systematic knowledge of the Chalcidoidea."

Since this was written, I have diligently and laboriously prosecuted my studies on these insects, and have now in MSS. a new classification of them, which I hope to publish this winter, in which I have recognized fourteen distinct families.

Inasmuch, therefore, as I have entitled this paper "On the Genera of the Eucharidæ," I desire briefly to put on record the names of these families and the new arrangement proposed in this work.

The families recognized and their arrangement are as follows:

Superfamily VII.—Chalcidoidea.

Family LX. Agaonidæ.
LXI. Torymidæ.
Subfamily I. Idarninæ.
II. Toryminæ.
III. Monodontomerinæ.
IV. Megastigminæ.
V. Ormyrinæ.
LXII. Chalcididæ.
Subfamily I. Leucospidinæ.
II. Chalcidinæ.
LXIII. Eurytomidæ.
LXIV. Perilampidæ.
LXV. Eucharidæ.
LXVI. Mischogasteridæ.
Subfamily I. Pireninæ.
II. Tridyminæ.
III. Mischogasterinæ.
IV. Lelapinæ.

LXVII. Cleonymidæ.
Subfamily I. Chalcedectinæ.
II. Cleonyminæ.
III. Pelecinellinæ.
IV. Colotrechninæ.
LXVIII. Encyrtidæ.
Subfamily I. Eupelminæ.
II. Encyrtinæ.
III. Signiphorinæ.
LXIX. Pteromalidæ.
Subfamily I. Merisinæ.
II. Pteromalinæ.
III. Sphegigasterinæ.
IV. Spalangiinæ.
V. Diparinæ.
LXX. Elasmidæ.
LXXI. Eulophidæ.
Subfamily I. Entedoninæ.
II. Aphelininæ.
III. Tetrastichinæ.
IV. Eulophinæ.
LXXII. Trichogrammidæ.
Subfamily I. Oligositinæ.
II. Trichogramminæ.
LXXIII. Mymaridæ.
Subfamily I. Gonatocerinæ.
II. Mymarinæ.

The family *Eucharidæ* takes its name from the genus *Eucharis*[1] Latreille, erected in 1805, for *Cynips adscendens* Fabricius, a species widely distributed over Europe, and described under the latter name as early as 1787, or a little over a century ago.

In 1811 Spinola described his genus *Stibula*[2] to contain *Ichneumon cyniformis* Rossi, evidently a misprint for *cynipiformis*, a species found in South Europe.

Latreille's definition of the genus was a broad one, and from this time down to the year 1829 all other species of Eucharids discovered in various parts of the world, showing any affinities, were described and placed in it. In this year, however, Latreille erected another genus, *Thoracantha*,[3] for a singular looking species discovered in Brazil.

In 1840 Blanchard described his genus *Psilogaster*,[4] while six

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[1] Latreille, Hist. Nat. Crus. et Ins., t. xiii, p. 210.
[2] Spinola, Ann. Mus., xvii, p. 150.
[3] Cuvier's Règne Anim., ed. 2, v, p. 297.
[4] Blanchard, Hist. Anim. Art., iii, p. 260.

years later Francis Walker, in his "List of the Chalcidiæ in the British Museum," brings the genera together and gives to the group the family name *Eucharidæ*, wrongly associating with them the genera *Perilampus* and *Caratomus*, neither of which belong here, although the former exhibits some affinities.

Subsequent to this publication new species and genera continued to be discovered. Westwood, who had announced his intention of monographing the group, in 1835 erected his genus *Schizaspidia*,[1] for a form discovered in India, while in 1868 he described his genus *Eucharissa*,[2] from the Cape of Good Hope.

In 1856 Förster recognized the group as a distinct family under the name *Eucharoidæ*.

Between this time and 1884 there was a long period of rest, so far as the establishment of genera, although new species continued to be described, especially by Francis Walker. In this year, however, Mr. Peter Cameron,[3] in working up the Mexican and Central American *Chalcididæ*, found it necessary to characterize four new genera, viz., *Orasema*, *Lophyrocera*, *Lirata*, and *Kapala*. He gave a good table for recognizing the new genera, and they were incorporated by Dr. Howard in his table of the *Eucharinæ*, prepared for Cresson's Synopsis of the North American Hymenoptera.

Two years later, however, or in 1886, the group received an excellent generic revision at the hands of Mr. W. F. Kirby,[4] Assistant in the Zoölogical Department in the British Museum.

This revision was based upon types and the extensive material in the British Museum, and is entitled "A Synopsis of the Genera of the Chalcididæ, Subfamily *Eucharinæ*, with Descriptions of Several New Genera and Species."

Brief but fairly good diagnoses of all the known genera are given, and in every case the type of the genus is mentioned. The following new genera were characterized: *Tricoryna*, *Metagea*, *Chalcura*, *Rhipipallus*, *Tetramelia*, *Uromelia*, and *Saccharissa*.

Mr. Kirby terminates his paper with a table of the genera, in which 12 genera are tabulated. He has, however, not included *Eucharissa* and *Saccharissa;* these he considers represent a new subfamily, which he calls *Eucharissinæ*, but does not define. In this separation I cannot follow him.

Mr. Kirby settled definitely the types of the various genera, and since the publication of his Synopsis it has been possible for the student to pursue intelligently further studies in the group. His

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[1] Westwood, Proc. Zöol. Soc. Lond., 1835, p. 69.
[2] *Id.*, Trans. Ent. Soc. Lond., 1868, p. 36.
[3] Cameron, Biol. Centr.-Am. Hym., i, p. 101 *et seq.*
[4] Kirby, Journ. Linn. Soc. Zoöl., xx, pp. 28-37.

table, slightly altered, was reproduced by me in Entomologica Americana, vol. iii, 1887, p. 186.

In 1894, Mr. John W. Shipp,* gave a short revision of the genus *Thoracantha* Latreille, based upon material in the Hope Museum, Oxford, in which five supposed new genera are characterized, viz.: *Lasionychus*, *Dilocantha*, *Lætotantha*, *Acrostela*, and *Isomeralia*.

Lasionycha Shipp equals *Uromelia* Kirby, while *Acrostola* Shipp is apparently based upon the male of *Thoracantha* Latr. At least, that is my opinion, since all the *Acrostolæ* I possess are males, and I had them placed as the opposite sex of *T. latreillei* before Mr. Shipp's paper appeared, and I see no reason for believing them other than the opposite sex of this common Brazilian species.

Of the habits of this group, comparatively little is known. Mons. L. Bedel, Bull. Soc. Ent. de France, 1895, p. xxxv, records the rearing of *Chalcura bedeli* Cameron from the cocoons of *Formica rufa* Linn.; while Mr. Cameron, in Mem. and Proc. Manchester Lit. and Phil. Soc., 1891, p. 5, records the interesting fact that Prof. Forel, of Zurich, obtained two specimens of *Eucharis myrmiciæ* Cam. from the cocoons of the Bull-dog Ant, *Myrmicia forficata* Fabr., sent him from South Australia.

Before giving a table of the genera now recognized, it may be well to give some of the structural peculiarities of the group which I believe entitle it to family rank.

The head is comparatively smaller than other Chalcidids, triangular, and much thinner antero-posteriorly; the mandibles are rather long, falcate, without or with one or two teeth within in one or the other mandible, both mandibles rarely being exactly alike.

The shape and characteristics of the mandibles alone will enable the careful student to separate at once a Eucharid from all others in the Chalcidoidea. But there are several other distinguishing characters: The thorax is most frequently very gibbous, the scutellum very large, abnormally developed, elevated, and usually produced posteriorly, the axillæ being connate, not distinctly separated from the surrounding surface, and broadly united along their inner margin, so as to separate widely the scutellum proper (middle lobe) from the base of the mesonotum.

The legs also are quite characteristic of the group, being unusually slender, with all the coxæ of very nearly an equal size.

The wings, too, offer some slight differences from other Chalcidids; they are almost entirely bare or devoid of pubescence, the front pair being somewhat broadly rounded at apex, with a moderately long marginal vein and a very short sessile or at most subsessile stigmal vein, the postmarginal vein being absent, very

* The Entomologist, 1894, June No., p. 184.

short or only slightly developed. The hind wings are proportionately larger and wider at base than in the generality of the other families, the costal cell being distinct.

The abdomen is always distinctly petiolated, the second segment abnormally enlarged and usually enclosing the following segments, or the greater part of them, while the female possesses a very broad saw-like ovipositor, the blade of which is very similar to that of a small saw-fly.

TABLE OF GENERA.

Females.

Antennæ 13-jointed or less.. 2
Antennæ 14-jointed or more.
Scutellum simple; antennæ 16-18-jointed.
1. Eucharissa Westwood.
Scutellum produced into a single long process at apex, and longitudinally striated; antennæ 14-jointed....2. Saccharissa Kirby.

2. Scutellum bidentate, or greatly produced into long processes over the abdomen 4
Scutellum simple, neither bidentate nor produced into long processes.
Antennæ not moniliform.. 3
Antennæ moniliform.
Abdomen compressed, ascending....3. Eucharis Latreille.
Abdomen neither compressed nor ascending.
First joint of hind tarsi much thickened; antennæ 11-jointed...........................4. Tricoryna Kirby.
First joint of hind tarsi very long, but not thicker than the others......................5. Metagea Kirby.

3. Joints of antennæ long; antennæ 11-jointed.
Thorax smooth, polished; petiole of abdomen abruptly enlarged at apex.... ....6. Pseudometagea Ashmead.
Thorax rugose; petiole of abdomen normal, long, cylindrical.
7. Psilogaster Blanchard.
Joints of antennæ short; antennæ 13-jointed.
Thorax not greatly elevated, punctate, with complete parapsidal furrows; mandibles long, acute at tip, the right with two teeth within, the left with one tooth within....8. Orasema Cameron.
Joints of antennæ serrate.
Antennæ 13-jointed..................................9. Rhipipallus Kirby.
Antennæ 11-jointed.................................10. Chalcura Kirby.

4. Scutellum with the processes usually as long as the abdomen and sometimes very broad and covering the abdomen........................ 5
Scutellum bidentate, the processes never very long.
Metathorax unarmed.
Metanotum with hump-like elevations above the pleura.
11. Stilbula Spinola.
Metanotum simple, without such elevations.
12. Schizaspidia Westwood.

Metathorax armed with strong lateral projections or teeth.
Metathoracic processes curving downwards.
13. Lophyrocera Cameron.
Metathoracic processes consisting of two diverging horizontal teeth........................14. Tetramelia Kirby.

5. Scutellar processes long and slender, generally curving inwards toward tips.. 6
Scutellar processes broad and covering the entire abdomen.
Thorax not pubescent, the apex of the scutellar projections simple, cleft, or notched.
Scutellar processes very broad, triangular.
15. Thoracantha Latreille.
Scutellar processes long, contiguous, and acutely pointed at extremity ....16. Uromelia Kirby.
(= Lasionychus Shipp.)
Scutellar processes long, contiguous, but very flat, the extremities rounded or subtruncate; mesonotum and scutellum medially impressed; head almost as wide as the thorax; antennæ 10-jointed, the third joint as long as the scape, the following much wider than long.
17. Dicœlothorax Ashmead, n. g.
Thorax pubescent; apex of the scutellar processes rounded and not sharply cleft, the notch extending two-thirds of the entire length.......................................18. Dilocantha Shipp.
Scutellar projections with the basal portion as wide as thorax, shortly compressed in centre, then dilated, and at the apex furnished with two rounded short spines..........................19. Lætocantha Shipp.
Scutellar projections with the basal portion as wide as thorax, produced and with the sides parallel, the apex furnished with a small semi-circular excavation, the apices of the spines being very sharp.
15. Acrostela Shipp.
(? = ♂ Thoracantha Latr.)

6. Head and eyes tuberculate; antennæ 12-jointed...20. Isomeralia Shipp.
(Type Thoracantha coronata Westwood.)
Head and eyes normal.
Antennæ 10-jointed, the third joint as long as all the rest united.
21. Lirata Cameron.
Antennæ 11-jointed, the third joint not much longer than the fourth.
Thorax not pubescent, the scutellum always longitudinally striated...................................22. Kapala Cameron.
(Type Thoracantha fuscata Fabr.)
Thorax clothed with a fine pubescence, the scutellum smooth, not longitudinally striated, the processes smooth to apices, where they are transversely serrated.
23. Lasiokapala Ashmead, n. g.

Males.

Scutellum bidentate, or produced into long processes over the abdomen 4
Scutellum normal or simple.. 2
Scutellum produced into a simple long process.
Antennæ 18-jointed.....................................1. Saccharissa Kirby.
2. Antennæ 22-jointed.......................................2. Eucharissa Westwood.
Antennæ 10 to 13-jointed.
Antennæ ramose 3
Antennæ simple.
Flagellar joints moniliform.
Abdomen compressed, ascending.
3. Eucharis Latreille.
Abdomen neither compressed nor ascending.
First joint of tarsi much thickened.
4. Tricoryna Kirby.
First joint of tarsi very long, but not thicker than the others............5. Metagea Kirby.
Flagellar joints cylindrical, not moniliform.
Joints of antennæ long; antennæ 10–11-jointed.
Petiole of abdomen abnormally and abruptly enlarged at apex; thorax smooth.
6. Pseudometagea Ashmead, n. g.
Petiole of abdomen normal, long, cylindrical; thorax rugose..... 7. Psilogaster Blanchard.
Joints of antennæ rather short; antennæ 13-jointed.
Thorax closely punctate; right mandible with two teeth within, the left with one tooth within......................8. Orasema Cameron.
3. Antennæ 11-jointed, biramose...............................9. Rhipipallus Kirby.
Antennæ 11-jointed, ramose.
Thorax coarsely rugose; face longitudinally striated.
10. Chalcura Kirby.
4. Scutellum with the processes very long, usually as long as the abdomen, and often very broad.. 5
Scutellum bidentate, the teeth never very long.
Antennæ simple.
Metanotum with hump-like elevations above the pleura.
11. Stilbula Spinola.
Antennæ ramose.
Metathorax unarmed............12. Schizaspidia Westwood.
Metathorax with strong lateral projections or teeth.
Metathoracic processes curving downwards.
13. Lophyrocera Cameron.
Metathoracic processes consisting of two diverging horizontal teeth.................14. Tetramelia Kirby.

5. Scutellar processes long and slender, generally curving inwards towards the tips 6
   Scutellar processes very broad, deeply, broadly, semicircularly emarginated at apex.................. ....15. Thoracantha Latreille.
   (=? Acrostela Shipp.)
   Scutellar processes long continuous and acuminate at apex; antennæ with 8 long branches.... ....16. Uromelia Kirby.
   (= Lasionycha Shipp.)
   Scutellar processes long continuous but rounded not acuminate at apex; antennæ with no long branches, serrated.
   17. Dicœlothorax Ashmead, n. g.
6. Eyes tuberculate.. 20. Isomeralia Shipp.
   Eyes normal.
   Mesonotum, scutellum and the scutellar processes longitudinally furrowed or striated.
   Third joint of antennæ very long; funicle with 7 branches which are scarcely longer than the third antennal joint.
   21. Lirata Cameron.
   Third joint of antennæ very short; funicle with 9 long branches.......................................22. Kapala Cameron.
   Mesonotum with the middle lobe coarsely transversely furrowed, the lateral lobes with the scutellum and scutellar processes smooth, not striated.......................23. Lasiokapala Ashmead.

This paper was followed by a brief discussion of the probable habits of the insects of this group, participated in by Messrs. Ashmead, Howard, and Schwarz. Nothing is known of their host relations, except two records of Australian species having been reared from the pupa of ants. Mr. Howard stated that he had seen a specimen of *Kapala furcata* in Mr. H. H. Smith's collection from St. Vincent, which carried an ant in its jaws. He thought this might possibly be significant, although, of course, the Eucharid might have clasped the ant in its death struggles in the cyanide bottle. Mr. Ashmead and Mr. Schwarz stated that Florida species occur commonly in localities where ants are abundant.

—Mr. Ashmead submitted for publication the following paper:

CLASSIFICATION OF THE OLD FAMILY CHALCIDIDÆ.

By William H. Ashmead.

At the meeting of the Entomological Society of Washington held December 2, 1897, I suggested the segregation of the old family Chalcididæ into 14 distinct families, and gave a tentative

list of these families, treating them as a whole under the superfamily name Chalcidoidea.

In the present paper I propose to give my tables for recognizing the families and subfamilies into which this superfamily is now divided.

Superfamily VII.—Chalcidoidea.

Table of Families.

Hind wings exceedingly narrow, linear, peduncle at base; ovipositor issuing from beneath just anterior to tip of abdomen; antennæ without a ring-joint, the scape rather small, short, compressed............12

Hind wings never very narrow, nor linear, not pedunculate at base; ovipositor issuing far anterior to the tip of abdomen; antennæ elbowed, with 1, 2, or 3 ring-joints, very rarely without, the scape large and rather long.

Axillæ triangularly produced or advanced forward into the basal region of the scapulæ, their base or anterior margin *on* or *in advance* of an imaginary line drawn from tegula to tegula; anterior tibial spur most frequently small or weak; tarsi 3–4-jointed, rarely 5-jointed or heteromerous. 10

Axillæ normal, or at least never produced forward into the basal region of the scapulæ, their base or anterior margin straight and always back of an imaginary line drawn from tegula to tegula; anterior tibial spur large and strong; tarsi 5-jointed (rarely 4-jointed, or 3- or 4-jointed in some wingless males).. 3

3. Head in ♀ oblong, with a deep, broad longitudinal furrow above, the occipital margin superiorly, usually with a small recurved tubercle or spine at its middle; mandibles or palpi most frequently furnished with saw-like appendages; anterior and posterior legs very stout, their tibiæ very much shorter than their femora, the middle legs very slender, sometimes aborted; hypopygium very prominent, acute, cultriform or lanceolate; ovipositor long, prominently exserted; ♂ always apterous, the head anteriorly with a deep triangular fovea, in which are placed the short 3–9-jointed antennæ; the abdomen in the ♂ is always long and tubular, thickened at base.

Family LX. Agaonidæ.

Head rarely oblong and quite differently formed, never with a deep broad longitudinal furrow above, most frequently transverse, or subquadrate, the occipital margin never with a small recurved spine; mandibles and palpi without saw-like appendages; middle legs not especially slender, the anterior and posterior legs are often stout, but their tibiæ are always longer, at least never shorter than their femora; hypopygium rarely very prominent; ♂ most frequently winged, rarely apterous; in the latter case the abdomen is normal, not long and tubular.

Mesopleura large, entire, without a femoral furrow, except occasionally in some males, the mesepisternum large, triangular, not extending to base of front coxæ; middle tibial spur saltatorial, most frequently long and stout, or dilated at base...... 8

Mesopleura always with a femoral furrow or impression, the mesepisternum variable, rarely large, except in the *Cleonymidæ*, most frequently small, wedge-shaped, or linear and extending to base of front coxæ; if large and triangular, either the anterior or posterior femora are much swollen; middle tibial spur not saltatorial, usually short or weak, never very stout.

Hind tibiæ with 2 apical spurs, rarely with 1 only; in the latter case the radius terminates in a large, rounded stigma, the ovipositor very long.............................. 4

Hind tibiæ with 1 apical spur; ovipositor rarely long, if long the stigma is small.. 9

4. Mandibles falcate, usually with 1 or 2 teeth within; thorax most frequently very gibbous, the scutellum usually very large, often abnormally developed, elevated and produced posteriorly, the axillæ connate, not distinctly separated from the surrounding surface and broadly united along their inner margins.................................. 6

Mandibles usually 3-4-dentate at apex, rarely falcate, with 1 or 2 teeth within; thorax not or very slightly gibbous, the axillæ distinctly separate, their inner margins most frequently widely separated, very rarely touching.

Hind coxæ rarely much larger than the anterior coxæ, most frequently smaller or equal; if much larger, the pronotum is elongate, mesepisternum large, the hind legs very long, the postmarginal vein very long; ovipositor very rarely prominent.. 5

Hind coxæ very large and long, usually five or six times larger than the anterior coxæ.

Hind coxæ subtriquetrous, or at least compressed into a sharp ridge above; hind femora never very much swollen, and most frequently simple, rarely with one large tooth or denticulate beneath; abdomen most frequently subcompressed (more rarely depressed), with a long ovipositor; if without an exserted ovipositor, the abdomen is conical or conic-ovate with a peculiar sculpture, the radius (stigmal vein) usually very short, the hind tibiæ at apex normal......................Family LXI. Torymidæ.

Hind coxæ usually very long and subcylindrical, rarely triquetrous; hind femora always much swollen and most frequently armed with teeth beneath or finely serrated, rarely without teeth; abdomen of various shapes, most frequently conical or conic-ovate, more rarely globose,

or oblong oval, the ovipositor very rarely prominent; radius variable, rarely very short; hind tibiæ strongly curved and obliquely truncately produced at apex, so that the tarsi seem to be attached a little before tips.

Family LXII. Chalcididæ.

5. Pronotum rarely transverse-quadrate, conical or conically produced anteriorly, or very short, transverse, and very much narrowed medially, rarely as wide as the mesonotum......... 7

Pronotum large quadrate or transverse quadrate, never very short, if somewhat shortened always as wide as the mesonotum.

Pronotum quadrate or subquadrate; abdomen in ♀ not triangulated, globose, ovate, conic-ovate or lanceolate and compressed or subcompressed, the hypopygium most frequently prominent plow-share shaped; second dorsal segment never very large; mandibles not strong, most frequent 4-dentate.

Family LXIII. Eurytomidæ.

Pronotum shorter, more transverse and as wide as the mesonotum; abdomen in ♀ most frequently triangulated, or globose, the second and third segments occupying most of the dorsal surface, the following very short and more or less retracted within the third; hypopigium not prominent; mandibles 2- or 3-dentate at apex..........Family LXIV. Perilampidæ.

6. Second abdominal segment very large and most frequently enclosing the following; coxæ not large, subglobose, nearly equal; all legs very slender; radius scarcely developed, its stigma sessile or subsessile.

Family LXV. Eucharidæ.

7. Mesepisternum not large, triangular; anterior femora never much swollen, the posterior femora also normal or only slightly swollen; marginal vein in hind wings usually long, the costal cell not reaching to the hooklets or spinulæ and most frequently very narrow; radius well developed....... ....Family LXVI. Miscogasteridæ.

Mesepisternum large, triangular; either the anterior or the posterior femora are much swollen and sometimes toothed, or both are swollen with the hind femora toothed; if with slender legs, the hind legs are very long, their coxæ long, cylindrical, while the radius (stigmal vein) in front wings is very short, with the postmarginal vein very long extending to the apex of the wing (Pelecinella).

Family LXVII. Cleonymidæ.

8. Mesonotum either depressed, with more or less distinct parapsidal furrows, the scapulæ longitudinally ridged, or convex or subconvex, entirely without furrows, rarely convex with distinct furrows; axillæ most frequently meeting at inner basal angles, rarely very widely separated...Family LXVIII. Encyrtidæ.

9. Mesonotum subconvex with incomplete or complete parapsidal furrows; hind coxæ rarely much larger than the front coxæ; axillæ

separated, not meeting at inner basal angles; mesepisternum usually small, wedge-shaped or triangular; hind wings with a long marginal vein; mandibles usually stout, 3- or 4-dentate at apex.

Family LXIX. Pteromalidæ.

10. Hind coxæ normal; mesopleura impressed.................................11

Hind coxæ abnormally large and dilated, their femora flat or compressed; tarsi very long; mesopleura entire, not impressed; marginal vein in front wings most frequently extraordinarily lengthened, the radius very short, scarcely dilated; mesonotum without furrows..Family LXX. Elasmidæ.

11. Tarsi 4–5-jointed, rarely heteromerous; anterior wings not short and broad, with the pubescence normal; marginal and radial veins normal; postmarginal vein often wanting; mesonotum with complete or incomplete furrows...............................Family LXXI. Eulophidæ.

Tarsi 3-jointed; anterior wings short and broad, broadly rounded at apex with the pubescences most frequently arranged in rows, more rarely normally pubescent; marginal and radial veins united in the form of a strongly curved line ∩.

Family LXXII. Trichogrammidæ.

12. Pronotum usually large, rounded, or conically produced anteriorly; wings always with a long marginal fringe, nearly veinless and always without a radius (stigmal vein), the marginal vein most frequently reduced to a mere dot; antennæ in ♀ most frequently terminating in a distinct fusiform or egg-shaped solid club, more rarely with a 2-jointed club; tarsi 4-5-jointed.

Family LXXIII. Mymaridæ.

Table of Subfamilies.

FAMILY LXI.—TORYMIDÆ.

Metathoracic furrows not well defined, the scapulæ therefore scarcely or indistinctly separated; ovipositor not exserted.............................. 3

Metathoracic furrows distinctly defined, the scapulæ therefore well separated; ovipositor always prominently exserted, most frequently very long.

Hind tibiæ with only 1 apical spur.. 2

Hind tibiæ with 2 apical spurs.

Posterior margin of mesepisternum incised beyond the middle; metepimeron curved, dilated above the apex; posterior femora simple, neither armed with a tooth nor serrate beneath.

Stigmal vein always long; abdomen usually more or less depressed, if subcompressed the hypopygium large and prominent; ♂ usually apterous, the head oblong, with a triangular fovea anteriorly in which lie the antennæ; abdomen short, not tubularly lengthened.......Subfamily I. Idarninæ.

Stigmal vein very short, the stigma sessile or subsessile; abdomen usually subcompressed, the hypopygium not prominent; ♂ most frequently winged, if apterous the head without the triangular fovea anteriorly.

Subfamily II. Toryminæ.

Posterior margin of mesepisternum entire; posterior femora beneath serrate or armed with 1 or 2 teeth.

Stigmal vein not long, but still not so short as in the *Toryminæ;* ♂ very rarely apterous, but always with the hind femora toothed.

Subfamily III. Monodontomerinæ.

2. Front wings with the stigmal vein terminating in a large rounded or dilated stigma or knob, the basal nervure distinct, straight.

Subfamily IV. Megastigminæ.

3. Abdomen in ♀ conic-ovate or produced at apex, in ♂ oblong, with a peculiar sculpture, the middle segments at base most frequently with transverse rows of rounded punctures; stigmal vein very short.

Subfamily V. Ormyrinæ.

Family LXII.—Chalcididæ.

Front wings longitudinally folded; ovipositor curving upwards over the dorsum of the abdomen....................Subfamily I. Leucospidinæ.

Front wings not folded; ovipositor straight, not curving over the dorsum of the abdomen.............................Subfamily II. Chalcidinæ.

Family LXVI.—Miscogasteridæ.

Abdomen distinctly petiolated.. 2

Abdomen sessile or subsessile.

Antennæ 8–10-jointed, inserted just above the clypeus or close to the mouth border..........................Subfamily I. Pireninæ.

Antennæ 12–13-jointed, most frequently inserted far above the clypeus, rarely just above it............Subfamily II. Tridyminæ.

2. Antennæ 12–13-jointed; marginal vein always shorter than the submarginal, the costal cell normal; second abdominal segment often large but not especially lengthened; ovipositor not exserted; mesothoracic furrows frequently complete.............Subfamily III. Miscogasterinæ.

Antennæ in ♀ 13–14-jointed, subclavate, inserted below the middle of the face; marginal vein very long, as long as or longer than the submarginal; second abdominal segment much lengthened; ovipositor exserted or subexserted; mesothoracic furrows complete.

Subfamily IV. Lelapinæ.

Family LXVII.—Cleonymidæ.

Subfamilies defined on p. 201 of this volume.

Family LXVIII.—Encyrtidæ.

Mesonotum not entire, usually depressed, the parapsidal furrows distinct, or at least more or less distinctly present, never entirely wanting; marginal vein usually long.............Subfamily I. Eupelminæ.

Mesonotum entire, convex or subconvex. the parapsidal furrows always entirely wanting.

Marginal vein rarely very long, often punctiform, and always much shorter than the submarginal or subcostal vein; stigmal vein, except in a single case, short but distinct; scutellum never short or transversely linear; middle tibiæ without lateral spurs...Subfamily II. Encyrtinæ.

Marginal vein long, as long as the submarginal or subcostal vein; scutellum very short, transversely linear; middle tibiæ with lateral spurs, the apical spur lobed.

Subfamily III. Signiphorinæ.

Family LXIX.—Pteromalidæ.

Abdomen distinctly petiolated. 2

Abdomen sessile or subsessile.

Metanotum *without* spiracular sulci and most frequently without lateral folds.......................................Subfamily I. Merisinæ.

Metanotum *with* the spiracular sulci always present, distinct; the lateral folds also present, either complete or incomplete, the median carina usually more or less distinct, rarely entirely wanting...................................Subfamily II. Pteromalinæ.

2. Front wings with a very long marginal vein, the costal cell very narrow 3

Front wings with the marginal vein not especially long, often short and thick, the costal cell not very narrow, normal.

Head, viewed from in front, short or rounded, the occipital line incomplete; antennæ 9–13-jointed.

Subfamily III. Sphegigasterinæ.

Head, viewed from in front, oblong, the occipital line complete; antennæ 8–12-jointed................ Subfamily IV. Spalangiinæ.

3. Mesonotum somewhat long; head anteriorly convex; scape long, extending beyond the ocelli...........................Subfamily V. Diparinæ.

Family LXXI.—Eulophidæ.

Submarginal vein broken or interrupted before uniting with the marginal vein and usually very short; stigmal vein not long, usually very short, the stigma subsessile; postmarginal vein most frequently entirely wanting.

Abdomen usually petiolate; submarginal vein very short, the marginal very long, the postmarginal usually more or less present; scutellum with 2 bristles near the middle; metapleura very small.....................................Subfamily I. Entedoninæ.

Abdomen sessile (rarely petiolate); submarginal vein not very short, the postmarginal vein *always* wanting.

Stigmal vein nearly obsolete, its knob sessile or subsessile; mesopleura without a distinct femoral furrow.

Subfamily II. Aphelininæ.

Stigmal vein distinct and moderately long; mesopleura always with a distinct femoral furrow.

Subfamily III. Tetrastichinæ.

Submarginal vein entire, not broken before uniting with the marginal vein, and usually distinctly longer than the marginal; stigmal vein long, distinct, rarely very short, the postmarginal vein always present..Subfamily IV. Eulophinæ.

FAMILY LXXII.—TRICHOGRAMMIDÆ.

Wings without regular rows of hairs...... .....Subfamily I. Oligositinæ.
Wings with regular rows of hairs.......Subfamily II. Trichogramminæ.

FAMILY LXXIII.—MYMARIDÆ.

Tarsi 5-jointed..Subfamily I. Gonatocerinæ.
Tarsi 4-jointed ....Subfamily II. Mymarinæ.

Commenting upon this classification, Mr. Howard stated that, in his opinion, the Signiphorinæ, which Mr. Ashmead had made a subfamily of the Encyrtidæ, should be given family rank, a conclusion which Mr. Ashmead was hardly prepared to accept, remarking that he had only adopted Mr. Howard's published views in making it a subfamily.

—Mr. O. F. Cook presented the following paper:

HUBBARDIA, A NEW GENUS OF PEDIPALPI.

By O. F. COOK.

The family Hubbardiidæ* differs from all other Pedipalpi in hav-

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* While this paper is passing through the press (March, 1899) it is found that the generic name Schizonotus Thorell, on which the family designation Schizonotidæ was based, was preoccupied by Ratzeburg in 1852, although omitted from Scudder's "Nomenclator." A change being thus necessary, I am deeply gratified at the opportunity of suggesting the use of the name Hubbardiidæ, as a further tribute of respect and admiration for the recently deceased discoverer of Hubbardia.

To replace Nyctalops Cambridge (Ann. and Mag. Nat. Hist., 1872 (4), X, p. 410), and Schizonotus Thorell (Ann. Mus. Civ. Genova, 1888, XXVI, p. 358) the name Schizomus is proposed, with *S. crassicaudatus* (Cambridge *l. c.*, p. 411), as type. Instead of Tripeltis Thorell (Ann. Mus. Civ. Genova, 1889, XXVII, p. 554), which was also preoccupied (Cope,

ing the cephalothorax separated into parts by a transverse membranous suture. In Schizomus there are two divisions, a large ovoid anterior, and a small, transversely oblong posterior, to which the third and fourth pairs of legs are attached. In Triplomus the posterior plate is subdivided by a median suture into two subquadrate parts, while in Hubbardia a pair of small, narrowly subtriangular plates are intercalated in the transverse suture. Although of small size, these are sufficiently large and well chitinized to render it extremely improbable that they have been overlooked in Triplomus by such careful arachnologists as Thorell and Kraepelin. The habit is very similar to that of Triplomus, the type of which I had the pleasure of seeing at Hamburg last year, through the kindness of Professor Kraepelin, who was then engaged in his revision of the Uropygi.

Schizomus was described from Ceylon, and Triplomus from Burma. The discovery by Mr. Hubbard of a representative of this group in the desert region of southern California accordingly extends the known geographic distribution of the family to the western continent and to a new zone and climate. That so peculiar a type, which has until this time eluded all collectors, should surrender to Mr. Hubbard is, however, but one of many testimonies to our President's unrivalled ability as a field naturalist, and may, with his permission, bear his name. The formal description follows:

HUBBARDIA, new genus.

Eyes entirely wanting.

Mandibles chelate; movable finger closing outside the produced inferior corner of the large, subquadrate proximal joint; the movable finger is flattened or channelled in the middle below, with the lateral margin entire and the mesial regularly pectinate with closely placed simple bristles; above these is a series of curved, barbed hairs; the inferior corner of the basal joint is produced into a process armed with two large and three or four small teeth; this joint is also provided with numerous long, barbed hairs.

Maxillæ six-jointed and provided with a simple claw; coxæ with long processes clothed on the mesial face with numerous barbed hairs; trochanter moderately produced distad below and armed on its mesial face at the base of this process with a small conical spine, the only prominence of this joint, excepting the somewhat elevated bases of the scattering hairs. Femur, patella, and tibia decreasing in thickness but of subequal length, unarmed except by the prominent bases of hairs, of which the

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1886), the new name Triplomus is here substituted. The type is *T. grassii* (Thorell, *l. c.*, p. 554, pl. v, fig. 1). These changes in nomenclature have been incorporated in the proof as far as seemed practicable without too extensive recasting.

PLATE III.

larger of those of the tibia are barbed. Tarsus with a pair of blunt, conic spines on the ventral face a short distance below the base of the large, simple claw, otherwise armed only with scattering hairs, of which the larger are barbed.

First pair of legs very slender, considerably longer than the body, consisting of 13 joints, the tarsus being 8-jointed; the tibia is subarticulated near the base; the first tarsal joint is very small, the second is nearly half as long as the others taken together; the third is as long as broad, and the others are distinctly longer than broad.

Second pair of legs slightly larger than the third and much smaller than the fourth; the coxa of the second legs bears a large, sharply conic process directed obliquely cephalad and laterad; the coxæ of the other legs are prominent at the distal corner in front but are not produced; the third and fifth joints of the last pair of legs are noticeably larger than in the others, but the femur is not so robust as in Schizomus; the metatarsus has its three joints subequal; to the last is movably articulated the three-pronged claw, of which the inferior division is short and is directed downward rather than forward.

Cephalothorax suboval, apiculate in front, divided into five parts, of which the anterior is much larger than all the others; behind this is a pair of small, narrowly subtriangular transverse plates unknown in other genera; these are followed by two others about as broad as long, similar to those of the genus Triplomus. Behind this pair of plates is a transverse, subarcuate sclerite which seems to belong to the thoracic rather than to the abdominal region, although previous writers have not so reckoned it.

Abdomen composed of 11 segments and a 1-jointed caudal process; eight of the abdominal segments are separated into two parts by a broad lateral space which is slightly coriaceous, but not chitinized, while the three distal segments are complete rings. The first ventral sclerite is enlarged at the expense of the second, and is much larger than the corresponding dorsal plate. The last segment is produced above into a blunt process.

Caudal appendage of supposed male with a short pedicel bearing a long, narrow, subtriangular body, which tapers from an abruptly enlarged base to a rather blunt apex. As in the other genera, the other sex has this process reduced to a small, upcurved rudiment, not capitate or otherwise enlarged.

HUBBARDIA PENTAPELTIS, new species.

Plate III, figs. 1a–1n.

Length of body of supposed male 11 mm.; width 1.5 mm.; length of cephalothorax 3 mm.; of abdomen 6.3; of caudal appendage 1.7 mm.; of first pair of legs 11.2; the specimen supposed to be a female measures about 6.5 mm. in total length, the abdomen being noticeably shorter and more robust than in the male; this specimen may, however, be immature.

Color of alcoholic specimens a rather bright brown in all the chitinized parts, the shade depending upon the degree of chitinization.

Three specimens of this species, secured by Mr. Hubbard at Palm Springs, California, two males and one female, No. 41, have been examined.

The habits of Hubbardia are detailed in the following field notes which show that Mr. Hubbard appreciated at once the novelty and interest of his discovery:

"PALM SPRINGS, CAL., *Febr.* 8, 1897.

"On February 7th I walked up to the mouth of a small cañon from which issues a considerable stream of cold water. . . . Under a stone close to the water I captured a remarkable little Arachnid, very closely allied to Thelyphonus, but slender and brown in color, and only about $\frac{1}{4}$ of an inch long. It ran like a ground spider, with its long bristle tail laid over its back I saw two specimens, but took only one, as I thought at first it was one of those ant-like spiders."

"PALM SPRINGS, CAL., *Febr.* 13, 1897.

"To-day I found a second specimen of that remarkable Arachnid which lives under débris of leaves or stones near the pools on the shores of mountain streams. My first specimen was about $\frac{1}{4}$ of an inch long; the one I found to-day is half again as large. It is very elongate and slender, and dusky red-brown in color, and has long antennæ-like front legs, the chelicers having but a single visible claw. The small specimen which I found the other day appeared to me to have a long bristle tail closely allied to its back, but when I took it out of the vial the next morning it was tailless. The specimen taken to-day has a most remarkable lanceolate appendage attached by a short and slender articulation to the tip of the long tapering abdomen. The thighs of the hind legs in this specimen are very thick and stout, and undoubtedly the two specimens are different sexes."

"PALM SPRINGS, CAL., *March* 6, 1897.

". . . Collected under stones along sides of water courses from Small West cañon and got . . . both sexes, 1 specimen of each of the new Arachnid near Thelyphonus."

In connection with Hubbardia it is permissible to refer to another related animal which I had collected in Liberia and presented at a meeting of the Society last year, giving it the name *Artacarus liberiensis*.

A close relationship with Schizomus was admitted, but the discrepancies of Cambridge's description (as Nyctalops) seemed to forbid reference to that genus.

Learning immediately afterwards that Professor Kraepelin, of Hamburg, was engaged in a revision of the whip-scorpions and

Schizonotidæ, I left my single, somewhat dilapidated specimen with him.

In his "Revision of the Uropygi," Professor Kraepelin includes Artacarus under Schizonotus, a disposition to which I am unable to assent. Having since secured additional material, I find that the large spine-like processes of the trochanter, patella, and tarsus of the maxilla of the male of Schizomus, as described and figured by Professor Kraepelin, do not occur in Artacarus.

The posterior sclerite of the cephalothorax has a median suture indicated by a difference of structure and color in the integument, though not membranous as in Triplomus and Hubbardia. Finally, the caudal appendage of the male is diamond-shaped in outline, not abruptly cordate-capitate as in Schizomus.

The genera of Hubbardiidæ are thus four in number; they may be distinguished as follows:

Posterior part of cephalothorax entire; trochanter and patella of maxillæ with a large spine-like process in males: Genus Schizomus.

Posterior part of cephalothorax with a median suture; trochanter and patella without such processes in either sex.............. ....

Suture of posterior part of cephalothorax chitinized; flagellum of first pair of legs with the third joint distinctly broader than long, the four following about as broad as long: Genus *Artacarus*.

Suture of posterior part of cephalothorax membranous; third joint of flagellum as broad as long, the others distinctly longer than broad..........

Cephalothorax with transverse suture simple: Genus Triplomus.

Cephalothorax with a pair of narrowly triangular chitinous plates lying in the transverse suture: Genus Hubbardia.

The Systematic Position of the Hubbardiidæ.

In Hubbardia the segmentation of the cephalothorax is carried a step farther than in the allied genera in the direction of the condition described by Grassi for his truly remarkable *Kœnenia mirabilis*, so that it becomes somewhat more probable that that aberrant type can be associated with the subclass Pedipalpi, notwithstanding the fact that the second pair of appendages, the so-called maxillæ of Thelyphonus and Tarantula* function in

* The application of this name has been the subject of much debate, notably between Professor Kraepelin and Mr. Pocock. Linnæus, having a specimen, described a species (*Phalangium reniforme*) which he identified with a form described and figured in Brown's History of Jamaica. This reference Mr. Pocock proposes to employ as the type of the genus Tarantula described by Fabricius from a specimen supposed to represent *Phalangium reniforme* Linnæus. Professor Kraepelin properly

Kœnenia as true legs, and are provided with the normal 3-pronged claw. In the structure of these appendages, as well as in that of the cephalothorax, Hubbardia and its relatives are evidently more primitive than either the Thelyphonidæ or the Tarantulidæ, both of which types have specialized beyond the condition in which the Hubbardiidæ remain. The former groups have, by some, been supposed to be connected by the Hubbardiidæ, since these possess a short caudal appendage, and in this respect appear intermediate between tailless and long-tailed forms. The possession of a tail is, perhaps, the chief reason why the Schizonotidæ have been associated by Thorell and Kraepelin with the Thelyphonidæ as a family of a suborder called Uropygi, from which the Tarantulidæ were excluded.

The more salient characters distinguishing the Hubbardiidæ from the Thelyphonidæ have been contrasted by Kraepelin somewhat as follows:

Family Thelyphonidæ.

Cephalothorax of a single piece to which all four pairs of legs are attached.

Eyes present, in three widely separated clusters.

Maxillæ 5-jointed, consisting of coxa, trochanter, femur, tibia, and hand, the last chelate, that is, with a movable finger.

Flagellum of first pair of legs 9-jointed.

Tarsi with two claws.†

Abdominal appendage long, jointed.

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refuses to interpret the Linnæan species from the reference to Brown, and wishes to take the Linnæan specimen (from the East Indies) as the type of the genus. However, a continuation of the same course of reasoning brings us to the view that the type of the Fabrician genus is the Fabrician *specimen* which Professor Kraepelin has examined and identified as *Phalangium palmatum* Herbst, a congener of Brown's animal, if not, indeed, the identical species. Whether we shall write *Tarantula reniformis* Fabricius or *Tarantula palmata* (Herbst), is still another of the interesting questions attending this nomenclatorial complication.

† In this, as in some other points, I am quite unable to agree with Professor Kraepelin; as far as I have been able to observe, the claws of the three families are not notably different. The large paired claws are certainly the same in all, and to the common base of these is immovably attached the much smaller third, or inferior, claw. This last is best developed in the Hubbardiidæ, but neither in Hubbardia nor in Artacarus does it correspond in size or direction to the claw of Schizomus, as figured by Professor Kraepelin. This drawing is evidently inaccurate, as it represents the claw as continuous with and immovably fixed to the end of the joint, while in reality it is flexibly articulated. Owing to this last fact,

FAMILY HUBBARDIIDÆ.

Cephalothorax transversely divided into two or three sections of unequal size, the third and fourth pairs of legs being attached to the posterior portion.

Eyes wanting or rudimentary.

Maxillæ 6-jointed, consisting of a coxa, trochanter, femur, a long patella, tibia, and hand, the last not chelate.

Flagellum of first pair of legs 8-jointed.

Tarsi with three claws, two dorsal and one ventral.

Abdominal appendage short, curved, or capitate, not jointed.

If now we tabulate in similar form currently accepted characters of the Tarantulidæ, it appears that the points of similarity between the Thelyphonidæ and Tarantulidæ are not less numerous than those which might be alleged between the Thelyphonidæ and Hubbardiidæ.

FAMILY TARANTULIDÆ.

Cephalothorax of a single piece to which all four pairs of legs are attached.

Eyes present in three widely separated clusters.

Maxillæ 5-jointed, consisting of coxa, trochanter, femur, tibia, and hand.

Flagellum of first pair of legs many-jointed.

Tarsi with two claws.

Caudal appendage wanting.

Formal 'characters' like the preceding are, however, frequently of the slightest value as affecting conclusions regarding phylogeny and systematic arrangement.

Thus in the above comparisons I have followed Professor Kraepelin's statements in regard to the maxillæ. I believe, however, that there is no very essential difference in the structure of that member in the three families, and that six joints are in reality present in all. It is easy to see that the large terminal claw of the Tarantulidæ is composed of two parts, the distal of which is smooth, being the true claw, while the hairy proximal portion is a somewhat reduced and strongly chitinized joint with which the claw has become immovably coalesced. The movable finger of the "hand" of the Thelyphonidæ is also evidently a joint and not a claw merely, so that Professor Kraepelin's intercalation of a "long patella" into the maxilla of the Hubbardiidæ seems unwarranted, unless the same joint is to be recognized elsewhere.

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the direction of the inferior claw may vary with regard to the axis of the leg, but it is constant in regard to the other prongs of the claw. In Thelyphonus, the inferior claw is shorter than in Hubbardia, while in Tarantula it is reduced to a rounded prominence.

The "patella," "tibia," and "hand" of Hubbardia correspond respectively to the "tibia," "hand," and movable dactylus of Thelyphonus, and to the "tibia," "hand," and basal part of the claw of Tarantula. As far as the number of joints is concerned, the difference is made not by intercalation, but by the fact that the claw of Thelyphonus and Tarantula has become fused with the distal joint and is no longer movably articulated with it as in Hubbardia. Here, however, the apparent similarity ends. In Thelyphonus, the distal joint with its movable claw has a vertical motion and is opposed to the produced superior corner of the fifth joint. The superior angles of the second and fourth joints are also strongly produced to assist in the formation of a powerful armature which depends for its efficiency largely upon the co-operation of the two maxillæ. With the exception of the last, none of the joints are, strictly speaking, opposable, a difficulty which the strong processes are evidently calculated to meet.

In Tarantula, on the contrary, the distal joint with its adnate claw has a horizontal motion and functions merely as a claw; it is not opposable to the preceding joint, which sends out no process to meet it, but is itself accessory to the prehensory mechanism formed by the third and fourth joints which are armed along both edges of their closely opposable mesial face with a series of large spines. The maxillæ of Tarantula are thus adapted to work separately in a manner which would be impossible in Thelyphonus. The short distal joints bring the prey against the spines of the long third and fourth joints which hold and impale it. The third joint in Thelyphonus is not specialized in the formation of the prehensory apparatus, but the second joint plays an important role with its powerful dentate processes. In Tarantula the third joint is second only to the fourth in size and specialization, while the second is reduced to a comparative rudiment. The complete difference in the mechanical principles and construction of the maxillæ in the two groups is further emphasized by the fact that the coxæ are adnate in Thelyphonus, but free in Tarantula. This condition permits in Thelyphonus the development of a muscular system for increasing the power of lateral prehension *between* the maxillæ, while the independent action of the parts in Tarantula requires no such basal modification, the chief muscular strain occurring in the opposition of the fourth joint with the third.

It is accordingly evident, in spite of the general similarity of the maxillæ, that these appendages offer, in the two families considered, no details indicating a common origin from a form with specialized maxillæ. Although having similar habits and occupying much the same place in the economy of nature, the Thelyphonidæ and Tarantulidæ have evidently achieved their present efficiency on two independent lines of development, and

it is manifestly illogical to associate with either of them a family which has not even entered upon similar development. The maxillæ of Hubbardia are still almost unmodified legs compared with those of either Thelyphonus or Tarantula. They stand in the vertical rather than in the horizontal plane; the claw is not coalesced with the distal joint; the joints are none of them truly opposable, and the armature is very slight and offers no evident homology to that of either Thelyphonus or Tarantula. Agreements and differences in other characters do not seriously affect the case, since there is no evidence to prove that the Hubbardiidæ are degenerate Tarantulidæ or Thelyphonidæ. The segmented cephalothorax once coalesced could not be expected to redivide, and the maxillæ once rendered effective by specialization would scarcely return to the primitive and undifferentiated condition of the ambulatory leg.

The Pedipalpi consist, then, if Kœnenia be included, of four very natural and compact groups of animals which by their diversity of structure and developmental history demand recognition as of more than family rank. With reference to the anterior appendages alone these groups may be distinguished as follows:

Second and third pair of thoracic appendages ambulatory in structure and function, and provided with three-pronged claws: Order Microthelyphonida, family Kœneniidæ.*

Second appendage modified to assist in feeding, and provided with a simple claw; third pair of appendages modified into tactile organs, without claws ....

Second pair of appendages vertical, with a movable claw: Order Colopyga.

Second pair of appendages horizontal, the claw immovably soldered to the last joint..

Second pair of appendages adnate at base; last joint with a vertical motion permitting opposition with a process of the preceding; other joints not opposable; third pair of appendages with a 9-jointed tactile flagellum: Order Uropyga.

Second pair of appendages free at base; last joint with a horizontal motion, not opposed to the preceding; third and fourth joints closely op-

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* According to Grassi, his *Kœnenia mirabilis* (Naturalista Siciliano, 1885, iv, p. 127), the palpi (maxillæ, second appendages) are 9-jointed, the cephalothorax is divided by two transverse sutures into three segments, of which the last is narrowed to form a sort of peduncle for the distinct abdomen; the abdominal rings are ten in number, and are without lateral sutures, and there is a long, slender, 13-jointed tail. Grassi bestowed the name Microthelyphonida for the order, for which Thorell has proposed a substitute in the form of "Palpigradi."

posed, provided with two rows of large spines; third appendages with distal joints broken up into very numerous minute articulations: Order Amblypyga.

In canvassing the question of the recognition of these groups as orders, it has been found that the points of agreement between any two or three of them have usually been common also to other Arachnida outside the Pedipalpi here recognized as a subclass. Notwithstanding the valuable suggestions of Pocock,* it does not appear that the isolation of the various arachnid major groups has even yet been appreciated. With some naturalists the fact that a group is small or monotypic is a reason for refusing to recognize it as of high rank systematically. Although Mr. Pocock is seldom open to criticism from this standpoint, it does not appear that the second subclass into which he would divide the Arachnida is a natural group, nor is he able to give it more than a negative characterization. It will be difficult to arrange the numerous groups into any such number of major subdivisions or subclasses, as most writers are now willing to admit. Morphological and embryological investigations will furnish light as to the affinities of the various types, but cannot be expected to dispose of the evident differences, or supply connecting links which nature has refused to preserve. The discovery of Hubbardia is, indeed, a reminder that all the returns are not yet on file, but it is nevertheless improbable that many important types remain uncollected.

Omitting the mites, the affinities and autonomy of which remain altogether uncertain, it does not appear that the Arachnida can be logically accommodated under less than six primary subdivisions. From their most striking peculiarities these may be briefly characterized as follows:

Abdomen provided with pectines and ending in a sting, which includes a pair of poison-glands: Subclass Toxicura,† order Scorpiones.

Abdomen without pectines, sting, or poison-glands..............................

Thoracic stigmata present; posterior legs with a row of large, obliquely T-shaped tactile organs; claws pedicellate: Subclass Mycetophora, order Solifuga.

Thoracic stigmata wanting; posterior legs without such tactile organs; claws sessile..............................

With jointed, paired, abdominal spinning-organs; palpi of males modified to assist in copulation: Subclass Maripalpi, orders Araneina, Mesothela.

Without paired abdominal appendages; palpi of males not utilized as copulatory organs..............................

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*Ann. and Mag. Nat. Hist., 1893, Ser. 6, vol. xi, p. 11.

†A new name to replace Ctenophora Pocock, already in use for a major group in Zoölogy.

Copulatory organs external, borne by the third (penultimate) pair of legs: Subclass Podogona, orders Rhignogastra, Meridogastra.(?)*

Copulatory organs, if present, concealed within the body.........................

Body distinctly constricted between the thorax and abdomen; tracheæ lamellar: Subclass Pedipalpi, orders Microthelyphonida, Colopyga, Uropyga, Amblypyga.

Body not constricted; tracheæ tubular: Class Holosomata, orders Opiliones, Cyphophthalma, Pseudoscorpiones.

Explanation of Plate III.

Hubbardia pentapeltis.

Fig. 1a. Body without appendages.
1b. Cephalothorax, more magnified.
1c. Maxillæ, from below.
1d. Maxilla, distal portion.
1e. First leg.
1f. Distal joints of same more magnified.
1g. Second leg.
1h. Third leg.
1i. Claw of second leg.
1j. Claw of third leg.
1k. Fourth leg.
1l. Mandible, lateral face.
1m. Mandible, mesial face.
1n. Caudal segments, lateral view.

131

January 6, 1898.

Vice-President Gill occupied the chair, and Messrs. Schwarz, Fernow, Marlatt, Wait, Mann, Pratt, Benton, Curry, Kenyon, Motter, Patten, Ashmead, Dyar, Johnson, Chittenden, Heidemann, and Howard, active members, and Soltau, corresponding member, also present.

—Under the head of "Short Notes and Exhibition of Specimens," Mr. Howard stated that a small Agrionine apparently belonging to the genus Telagrion had been received by him from

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* Although perhaps related, it is evident that Anthracomartus, the fossil type of Karsch's order Anthracomarti (for which the name Meridogastra has been substituted by Thorell) is very far distant from the existing form Cryptostemma, for which the order Rhignogastra is established. I have had the opportunity of collecting and observing alive this exceedingly rare and interesting genus.

Para, Brazil, with the statement that its bite is said by the natives to be fatal. He reviewed the superstitions in English-speaking countries of the dragon-fly. Mr. Schwarz suggested that perhaps the correspondent had sent the wrong insect—not the one to which the superstition is attached, and further stated that dragonflies are not feared in Germany.

—Dr. Dyar exhibited a new species of the genus Lophyrus, reared from the larva collected by Mr. Pratt on Arborvitæ at Woodstock, Va. He presented for publication the following description of this species:

A NEW SAW-FLY.

By Harrison G. Dyar.

Lophyrus pratti, n. sp.

♀.—Antennæ 20-jointed. Black, shining, posterior angles of prothorax and pleura shaded with luteous; legs luteous, whitish on the joints and reddish on tarsi, coxæ at base and center of femora black; tibiæ and tarsal joints outwardly a little blackish. Lanceolate cell with straight cross-line; veins black. Length 5.5 mm.

Larva.—Thorax thickened, thoracic feet moderate, the head small in proportion, 1.6 mm. wide; abdomen tapering posteriorly, the anal segment small. Segments regularly 6-annulate, the spiracle on the second annulet, the segmental incisures practically indistinguishable from those of the annulets. Very minute points on the first, second, fourth, and sixth annulets and on the subventral folds, rather numerous. Whitish green, a shaded, but defined dorsal band, obscurely geminate; a similar band on the side just above the spiracles, broad, continuous, and single, both bands grayish black, unbroken. Feet pale, the abdominal ones on joints 6 to 13. Head round, shaded with leaden over the vertex, pale below; eye black. Differs from *abietis* Harr. in the pale head and thoracic feet, and apparently also in having only one stripe on the sides. (I have not seen *abietis* larva in nature.) Differs from the pine-feeding Lophyri in being without spots.

One ♀ bred by F. C. Pratt from larvæ on Arborvitæ* at Woodstock, Va., in June.

Note.—Since the above description was read, it has transpired that all the larvæ preserved by Mr. Pratt are probably in the ultimate stage, not in the last feeding stage as I supposed, hence the above comparisons with allied species are not valuable. I suspect that *L. pratti* is the same as the common Lophyrus

* The plant was determined by Mr. Pratt in the field. It is probably the *Thuja occidentalis*.

that occurs in abundance in the pine woods in the District of Columbia. This species has a larva exactly like that of *L. fabricii* (Journ. N. Y. Ent. Soc., v, 200); but the flies have 20-jointed antennæ in the ♀ and 18-jointed in the ♂. Therefore I let the new name stand, pending an investigation of the exact value of larval characters as compared with the number of joints in the adult antenna.

Mr. Fernow suggested that the plant was probably red cedar and not Arborvitæ. No decision could be reached.

—Mr. Schwarz exhibited an Erotylid beetle, the genus of which is new to the United States. It was *Hæmatochiton elateroides* Gorham, and was collected by Mr. Hubbard in the Chiricahua Mountains at an elevation of 10,000 feet. It was previously only found at Ventanas, in the State of Durango, Mex., and in the vicinity of Mexico City.

—Mr. Pratt exhibited adults and larvæ of *Sciara fraterna*, and read the following note:

A NOTE ON A BRED SCIARA LARVA.

By F. C. Pratt.

On August 2, 1897, while at a small farming place near Poolesville, Montgomery Co., Md., my attention was attracted early in the morning by what appeared to be a snake crawling very slowly across the road, but to my surprise on closer examination I found that the snake was simply a mass of moving dipterous larvæ. These larvæ measured $\frac{3}{8}$ of an inch in length, and were about the thickness of a No. 5 Klaeger pin.

In the bright morning sunlight the color of the mass was of a steel blue. After obtaining a supply of specimens I watched the remainder. The space made by taking specimens from near the middle of the mass was soon filled up by the rear half of the larvæ, which hurried along and joined the front half, the latter meanwhile traversing not more than two inches before being overtaken. The entire length of this snake-like mass was 15 inches—$\frac{3}{4}$ of an inch wide and $\frac{1}{2}$ an inch in depth. It tapered off at the posterior end, resembling the tail of a snake. The popular impression at Poolesville concerning these "snake worms" or "worm snakes," as they are locally termed, is that froth dropped from a horse's mouth will change to one of these "snake worms" before sundown. No further information was obtainable as to the ultimate destination of the larvæ, but they were no doubt bent on finding some suitable place to pupate. The larvæ obtained were placed in a jar containing damp sand August 3, where they immediately

commenced to form a small "snake" by crawling all around the jar. On the following day they were beginning to transform to pupa, becoming so contracted that they were scarcely more than half the length of the full-grown larva. The first perfectly developed pupæ were observed August 5, the adults issuing on the morning of August 7; thus making the pupal period two days. The flies that issued were probably females, their swollen abdomens, which were about four-fifths the entire length of the insect, seeming so heavy as to prevent flight.

The gregarious habits of the larvæ of the genus Sciara are well known, and have received notice in Insect Life and elsewhere, and have been the subject of special mention by Baron C. R. von Osten Sacken (see Proc. Entom. Soc. Phila., vol. I, 1862, pp. 163–165.) The species, of which the habits are known, are, with few exceptions, scavengers. One species, however, *Sciara mali* Fitch, is said to feed on ripe apples, and is hence of slight economic importance. The shortness of my visit did not permit of obtaining any knowledge of the food-habits of the species under observation. The bred material was referred to Mr. D. W. Coquillett, who identified the species as *Sciara fraterna* Say.

Mr. Schwarz said that these worm snakes are apparently much rarer in the United States than in Germany, where they are frequently observed and where many notes have been published about them. He had never seen one in the United States. The habit of the larvæ in congregating in snake-like masses is very difficult to explain. Possibly it only occurs when the larvæ are about ready for pupation, as suggested by Mr. Pratt.

Mr. Johnson said that he had heard of two such occurrences in Maryland during the past summer. He also said that he had received a well-substantiated account of such a worm snake in Ohio, which was said to be six feet in length.

—The next order of business was the annual address of the President, Mr. Marlatt, which was entitled "An Investigation of Applied Entomology in the Old World."

ANNUAL ADDRESS OF THE PRESIDENT.

AN INVESTIGATION OF APPLIED ENTOMOLOGY IN THE OLD WORLD.

By C. L. Marlatt.

It became possible for the writer to spend some little time in Europe during the latter half of the year just passed (1897), and while the trip was, in a way, a private one, and taken primarily for personal instruction and recreation, it was the intention to combine with it an examination of matters connected with entomological work in Europe, particularly as an applied science. That the practical side of the science of entomology was of especial interest will be at once understood, and, in fact, the investigation of this phase of the subject was made a duty owing to official relations with the Department of Agriculture. It was felt that if personal acquaintance could be made with men themselves and their methods, and especially with the conditions under which work is done in Europe, it would be of decided value in connection with similar work being done in this country, and particularly as a basis of a more exact appreciation of the value and applicability of the methods of control employed in the Old World for the New. Special pains, therefore, were taken to go out of the line of ordinary travel, where necessary, to visit stations and see individuals to secure the information desired. A difficulty, which had not been unforeseen, was experienced, especially at the outset, in that, in a number of instances, the individuals whom it was desirable to meet were themselves absent on vacation trips. This was especially true of the curators and officials connected with the museums of London and Paris.

This account will be confined to the personal experiences and observations of the writer, and, therefore, in no sense lays claim to be a complete survey of the subject. A complete review of the applied or economic entomology of the countries visited is quite unnecessary in this place, since this subject has been very carefully and fully covered recently by Doctor Howard in his presi-

dential address before the Association of Economic Entomologists (August, 1894). In this address a general review of the work being done in various foreign countries is given, and changes and innovations are of such rare occurrence that this account is still correct in essential details. As an account of personal experiences, it seemed advisable to adopt the narrative style, and the countries, cities, individuals, and institutions are discussed in the regular sequence of travel, and often in a very general and fragmentary way.

At the end is given a brief summary of the impressions, from the point of view of the economic entomologist, but, in general, the reader is left to draw his own conclusions from the presentation of facts made.

Very little time was devoted to England, and the few days that were spent there were given to the city of London. The Secretary of the Board of Agriculture was visited, and the subject of economic entomology as carried on by the government of Great Britain was freely discussed. The condition of affairs at the present time is the same as described by Doctor Howard in the article already cited, and the work can hardly, in any sense, be compared with that which is being done in this country. The Board of Agriculture, as at present constituted, is itself of rather recent origin (1889), and there is no arrangement for continuous entomological investigation. Mr. Charles Whitehead, who comes nearest to being the official entomologist of Great Britain, is styled the "technical adviser" of the Board on this subject, and receives a retaining fee merely of some 200 pounds. He is a man of wealth, whose hobby is agriculture, and he has been able to do a great deal of good in disseminating knowledge of habits of, and the remedies for, injurious insects in connection with this Board. No research work whatever is done by the Board of Agriculture in entomology. Most of the inquiries which come into the office are answered by circulars prepared by Mr. Whitehead or others, and if any new insect pest of importance arises which is not covered by circulars in hand, it is sent to Mr. Whitehead, and his report is printed as a leaflet. There is a great deal of work done in the way of correspondence, the letters averaging frequently 30 a day, and during seasons of special insect prevalence as many as 400 letters are sometimes received in a single day. The writer

expected to meet Mr. Whitehead, and had some correspondence with him to that end, but, owing to the death, at the time, of a member of his family, the project had to be given up.

Formerly the Royal Agricultural Society attended to a great deal of the entomological work of the kingdom through Miss Ormerod, and latterly through Mr. Cecil Warburton. Mr. Warburton, who is also connected with the Zoölogical Laboratory at Cambridge, reports somewhat as does Mr. Whitehead, and is the technical adviser on all insect matters coming before the Royal Society. At present the Royal Society is doing very much less work in entomology than in the time of Miss Ormerod, and inquiries of this nature are going more and more into the hands of the Board of Agriculture.

It is to be regretted that it was not possible, with the time at command, to visit the veteran English economic entomologist, Miss Ormerod, who, as is well known, continues actively at work in the dissemination of entomological information by means of circulars, pamphlets, etc., much of it independently, and also through the agency of local agricultural societies.

The entomological department of the British Museum of Natural History, South Kensington, is also slightly related to the economic work in entomology in Great Britain. Mr. C. O. Waterhouse, in particular, is making a biological exhibit in entomology, and gives special attention to insects of importance to agriculture. He also, as he informed the writer, assists Mr. Whitehead in any matter with which the latter is unfamiliar or unable to work out for himself.

On account of its being the vacation season, it was possible to make the acquaintance of but few of the entomologists of the Department of Zoölogy of the Museum. In company with Mr. Waterhouse, however, a rather hurried examination was made of the collections and exhibits in entomology, and particularly the biological displays, in which Mr. Waterhouse takes considerable pride. The writer had the pleasure of meeting Mr. Austin, who is now doing some work on the Cuterebras, and saw Mr. Kirby for a few minutes only, as the latter was on the eve of departure for a vacation in Germany. Some little time, also, was spent in the examination of types of American insects. The main collections of insects, which are not open to the general visitor,

are in low basement rooms, lighted on one side only, and with south exposure. Work tables are placed before these windows, and the collections are along the rear and side walls. The specimens are kept in large glazed drawers, in low, closed cabinets. The condition of labelling and of the specimens themselves, judging from a very cursory examination, is not so good as one would expect from the elaborateness of the published lists.

The force in entomology, including Dr. Butler, the Assistant Keeper of the Department of Zoölogy, numbers some eight persons and some boy attendants. Mr. Waterhouse is the first-class assistant, and in charge of the Department of Insects, and such men as Kirby and Austin rank as second-class assistants.

A brief stop in Paris, which followed, permitted of an examination of the *Museum d'Histoire Naturelle* in the *Jardin de Plantes*, and the entomological station under the Ministre of Agriculture (*Institute National Agronomique*). The same condition which characterized London was again experienced, viz., the absence of many of the persons working specially in entomology, and at the museum, with the exception of two or three *préparateurs*, none of the regular staff was present. The methods of work, however, of the Department of Insects were carefully examined. The main and systematic collection in the museum proper is in most excellent condition, and luxuriously housed as compared with our own National Museum in this particular. The systematic collections are not open to the general public, and are stored in low cabinets with rather large drawers or trays. There is, also, a popular display of insects of very considerable extent, partly surrounding the interior corridor of the upper floor. The quarters for the preparation of specimens, the library, and general work rooms are in a building apart. Émile Blanchard is the professor of entomology, and there are several assistants, such as Kunckle d'Herculais and Lucas, and also several *préparateurs*.

The Government Entomological Bureau of France, if it may be so termed, is connected with the *Institute National Agronomique*, 16, Rue Claude Bernarde. Dr. Paul Brocchi is the professor of zoölogy and director of the *Station Entomologique de Paris*. Dr. Paul Marchal, *Chef des travaux à la Station entomologique de Paris*, is charged with the practical workings

of the station. Some hours were spent in the laboratory of the latter discussing entomological matters and examining methods of work, and also arranging with him to assume charge, if desired, of the collection of predaceous beetles for shipment to this country to prey upon the gypsy moth. It was learned that all of the expenses of the office are limited to 2,000 francs per annum, which, of itself, is sufficient illustration of the meagreness of the opportunities for original work or necessary equipment. The methods followed in the rearing of insects and studying the life-histories are very similar to those employed in Washington, but rather simpler and on a very much smaller scale. There is little opportunity for field investigations. This entomological station is of comparatively recent origin (1894), but owing to the conditions which prevail in France, as in other portions of Europe, in the matter of comparative freedom from insect damage, it will probably never assume great importance. All information sent out from this station in reply to correspondents is given gratis. Occasionally posters are prepared on some special insect outbreak, and are displayed conspicuously in public buildings throughout the infested territory. The results of the work of the station are published in the various scientific journals of France, and sometimes in the bulletin of the Minister of Agriculture.

The necessity of a central entomological bureau is not very great in France—and this is also true, to a degree, of other European countries—from the fact that throughout the republic there are agricultural stations and school farms, with which are often connected professors of entomology and zoölogy who give immediate information to their respective districts about any local matters that may arise. Such information or advice is not, however, gratis, but a fee is taken therefor, as would be the case with any other professional man, such as a doctor or a lawyer. This applies to a man like Professor Noel, Director of the *Laboratoire Régional d'Entomologie Agricole* at Rouen, and Professor Valery Mayet, in charge of the department of entomology of the *École Nationale d'Agriculture* at Montpellier. The number of stations, laboratories, or schools in the interest of agriculture in France is very great, perhaps over 50 all told, and in many of them information about insects may be gained.

All the requests for information addressed to the Minister of

Agriculture, at Paris, are attended to by Doctor Marchal, as stated, without charge.

In France the great insect question has, for more than a quarter of a century, been the subject of the control of the Phylloxera, and this insect has for years been honored with a special commission. This commission, however, is not a permanent organization, but is simply a committee which meets from time to time, having no definite quarters, and subject to constant changes. Its work has been thoroughly explained on this side of the Atlantic and needs no description here. No attempt will be made to enumerate all the stations at which entomological work is carried on in France, but later an account will be given of a visit to the viticultural station at Villefranche, conducted by M. Vermorel.

Of insect damage in France the writer can speak of none from personal observations. It is a country of limited extent and with very small holdings, so that insect outbreaks are apt to be early discovered, and the depredators promptly stamped out by hand methods. Our insecticides, arsenical and other, are little known and less employed. Very little real damage of the disastrous sort often witnessed in the United States is ever experienced. Occasionally there will be an outbreak, as everywhere else, but it is usually short-lived. For example, the gypsy moth was quite troublesome about two years ago in the forests of Fontainbleau, but it seemed to have quite disappeared and has not been found at all the present year, and in riding through a portion of these forests I saw no evidence whatever of injury. This incident illustrates the fact, which was repeatedly impressed, that invasions like that of the gypsy moth or allied forest caterpillars, while they may at times be as severe as is now being experienced about Boston, are not lasting, and the insects disappear naturally of themselves. In northern Italy, for instance, the gypsy moth was reported to be quite abundant last year, but here, again, has apparently entirely disappeared—at least nothing could be heard of it; and in rather extensive traveling over this portion of Italy no indications of damage were noted.

Among the men who have become prominent in France in connection with applied entomology and vegetable pathology, there is no name so familiar on this side of the Atlantic as that of Vermorel, and this holds true, also, for France and southern Europe.

M. Vermorel has much of the American energy and push, and beginning as a poor man, a mechanic, has built up an immense establishment, employing some three hundred hands, chiefly for the manufacture of insecticide and fungicide apparatus. But he is a good deal more than a mere manufacturer of apparatus. He conducts a large private experiment station, the *Station Viticole*, at Villefranche, with attached vineyards and laboratories, and with a corps of entomologists, chemists, and other experts, at his own expense, and is, furthermore, a most enthusiastic student of the injurious insects as well as of the fungous diseases, methods of culture, etc., of the grape. He is also a most voluminous publisher, and a collection of his books and pamphlets and serial journals on the culture of the grape, its diseases and insect enemies, makes a small library by itself. He also publishes large charts of important injurious insects for use in agricultural schools, etc. The long trip from Paris to Villefranche was undertaken especially to visit this establishment, and a very pleasant and instructive day was spent there. Mr. Vermorel, himself, was absent attending a viticulture convention at Trient, Austria, but he had arranged with his assistants to have the shops and machines thoroughly exploited, and also the viticultural station, laboratory, vineyards, and wine-house, which are located on his estate a few miles out of town. Many of Mr. Vermorel's machines and ideas have been copied by American manufacturers, and it was stated that no benefit had been derived from his attempt to exploit his contrivances on this side of the Atlantic, and especially at the World's Fair, at Chicago, where he made a very large and creditable exhibit, donating the apparatus afterwards to the Department of Agriculture. Several of his later and more complex machines were put in operation, and exhibited a very flattering degree of efficiency. Some of his distributers of liquids and powders are much better than anything of a similar sort that we have here. In his immense factory, with hundreds of machines ready for shipment, one gets a better idea than elsewhere of the universality of the practice, in France and adjoining countries, of controlling insects and fungous diseases by spraying and dusting or the injection of poisons into the soil. Practically all of these machines and methods are for use in vineyards—the culture of the vine being the great predominating industry of France, Italy,

Switzerland, and upper Austria—and everywhere the foliage of the grape presents the characteristic bluish-white effect of the Bordeaux wash. Spraying for insects, or other treatment, does not often present any visible indication, and is, for the most part, at other seasons and diverse in methods, such as the treatment for the Phylloxera and the various vine and fruit worms.

From France the writer passed rapidly through Switzerland into northern Italy, and thence through the Austrian Tyrol and Bavaria to Munich, and later to Vienna, making some stops between. Little, in an entomological way, was accomplished during this portion of the trip, excepting that derived from familiarity gained with the forest conditions and growth, the characteristic fruits and methods of culture in the districts passed through. As noted elsewhere, the summer of 1897 was an exceptionally unfavorable one for insects, and throughout this region no insect damage of any moment to either cultivated plants or forest trees was observed. Occasionally, especially in the Inn Valley, many trees were seen banded with insect-lime, and, later, similar applications were noted in some of the large royal domains or parks in Bavaria, but in no case did there appear any special reason for this banding, nor any evidence of damage from larvæ, and, furthermore, if there had been occasion for its use, the lime would have been utterly worthless as a protection against insects, because it had hardened and could offer no barrier whatever to the passage of larvæ over it. It was not surprising, therefore, to learn at Vienna that tree-lime is far from being generally esteemed, and that many intelligent entomologists deem it comparatively worthless, or a "mere fad." It is a new remedy, having been used to any extent in Austria only during the last three or four years.

At Innsbruck the writer had the pleasure of seeing Professor Dalla Torre, whose voluminous catalogues of the Hymenoptera have made him well known on this side of the Atlantic. He is connected with the K. K. Leopold-Franzens-Universität as assistant professor of zoölogy, and is a vigorous middle-aged man, most energetic in habits, and evidently a prodigious worker. A very pleasant half day was spent in his rooms, looking over his work and discussing entomological matters with himself and wife, who takes a keen interest in the science.

Munich, surrounded by its vast flat area of farmlands, devoted chiefly to the culture of annuals, has little to offer entomologically in the late fall. The region about Salzburg is interesting as a forest district, and as exhibiting the system of forest management. The trip from Linz down the Danube to Vienna, through the vast agricultural region bordering this river, marked here and there by little rural villages, was very interesting and novel to American eyes from the absence of scattered farm-houses—the village life predominating. This region was instructive as giving an idea of the agricultural and forestry conditions of the valley of the upper Danube.

In Vienna better fortune was had in finding in town most of the entomologists connected with the Kaiserlich Königlich Naturhistorisches Hofmuseum, and some very instructive interviews were enjoyed with several well-known students of insects at the Austrian capital. The "Imperial, Kingly Natural History Court Museum," a splendid, palatial edifice, just off the famous "ring strasse," and fronting and exactly duplicating the Art Museum on Maria Theresa Platz, is undoubtedly the most magnificent natural-history museum building in the world. The Department of Insects is most liberally provided for, having a number of very large rooms, amply furnished with large cases for the collections. There is no crowding, and ample space is present for immense additions of material. The collections seem to be well arranged and classified, and are perhaps in better condition than the similar collections in any other museum visited. It may be doubted if in any museum in Europe better conditions prevail or are the collections better housed and arranged. The value and character of the collections as depositories of types will not be discussed, but it may be merely mentioned that they contain Signoret's collection of 30,000 specimens in Hemiptera and most of his types, and in Diptera the collections of Schiner, Meigen, Low, Brauer, Rondani, and others.

To those who are more or less intimately associated with natural-history museum work in this country, a brief statement of the conditions governing the official staff and of the civil-service rules of this institution will be of interest. One sees here the principles of civil service carried out to their fullest legitimate extent. The higher positions of the museum are filled by regular promo-

tions from the lower places, and a man of ability entering at the very bottom, with a salary of perhaps 800 florins ($320) a year, may ultimately reach the highest position in the museum, viz., that of "intendant" or official head. The officers of the museum are retired after forty years' service, on full salary, and if they choose to retire after twenty years' service, are paid thereafter one-half the salary received at that time of retirement. The hours of work are from 9 to 2 o'clock, and six weeks' annual vacation is granted.

The acting head of the museum at the time of my visit was Doctor Frederick Brauer, the famous dipterologist, who held the position in the absence of one or two persons still above him in rank. Unfortunately, Dr. Brauer was found very busy with an official meeting of the heads of different departments, and was able to see the writer but for a moment. Under the guidance, however, of Mr. Anton Handlirsch, one of the curators, a complete survey of the department of insects was made. In this museum the importance of the entomological work is fully recognized, and some six of the twelve men working in zoölogy are assigned to the Department of Insects, including such well-known names as Doctor Frederick Brauer, who has general charge and is Curator of Diptera and Neuroptera; Mr. Anton Handlirsch, Curator of Hemiptera; Doctor L. Ganglbauer, Curator of Coleoptera and Orthoptera; Franz Kohl, Curator of Hymenoptera, and Doctor H. Rebel, Curator of Lepidoptera.

The insect boxes employed here are of large size, nearly as large as the old boxes formerly employed in our National Museum, and are of very simple character, the glazed cover fitting with one flange into the bottom of the box, and the shoulders being lined with chamois skin to make a close joining. These trays or boxes are kept in large, low cabinets, arranged for the most part in the centre of the rooms. The collections are protected from pests by frequent inspections and the security afforded by the chamois-skin lining mentioned, and also by the inclosing cabinets, which are well made.

In Vienna there is no official entomological bureau charged with the economic phases of the science for the Austro-Hungarian Empire as a whole. Whatever information the government may desire, from time to time, relative to insects, is gained by direct

application to the museum by the Minister of Agriculture or other official.

In conversation with the entomologists of the museum some facts of more or less interest were collected relative to the appreciation of the subject of applied entomology in Austria, at least from the standpoint of the systematic entomologists of the capital. Of interest to us is the gypsy-moth problem. The larvæ of this insect are stated to be present every year, as are other forest caterpillars, but never, or rarely, become especially abundant. No faith was had in the theory that this insect is controlled or kept in check to any considerable extent by large predaceous beetles, such as the Calosomas, for the simple reason that the infested districts are too rare or remain infested for too short a time for any extraordinary multiplication of predaceous enemies. In other words, the gypsy-moth takes a position in Austria, and this seems to hold good for Europe generally, with the other common leaf-eating species, and occasionally is destructive over larger or smaller areas, disappearing after a year or two, and perhaps not returning for many years. The same succession of periods of insect damage of various sorts occurs there as here, and they also find, as here, that newly imported insects are especially destructive for a few years, and then subside into a condition similar to that characterizing the insects indigenous to the country. This is true of the Phylloxera, which at first caused excitement and alarm, but is now much less feared than formerly, and, in fact, is under very satisfactory control. The little faith manifested in insect-lime has already been commented upon.

Applied entomology receives considerable attention in Austria, however, in the agricultural, and particularly the forestry, schools, and especially at the Forestry Institute at Mariabrunn, near Vienna. The forest insect of perhaps greatest importance is the "Nonne" (*Psilura monacha*), which is the cause, at times, of most serious damage to the forests of Coniferæ of the Empire. Opportunity did not, however, offer to see any districts where this insect was abundant.

Among the other students of insects in Vienna, the writer had a very pleasant experience with Professor Josef Mik, the well-known dipterologist. Professor Mik has charge of the instruction in natural history at the Akademischen Gymnasium, of Vienna,

and his classwork is very heavy, averaging 18 hours every week. Most of his entomological work, therefore, is accomplished during his two months' summer vacation. His collection and library, and much of the work now in hand, was inspected. He is preparing, among other things, a popular work on entomology for school use, illustrated with handsome plates drawn by himself in highly creditable style. On leaving him the writer was much surprised and not a little confused to be saluted with a most hearty kiss, a custom for which an American would hardly be prepared.

From Vienna to Budapest is only a few hours' trip, and is through a region devoted to agriculture and the growth of vines, the latter hugging the hillsides and rough country, and the former covering the broad, almost illimitable valley of the Danube, which is flat and uninteresting, and devoted chiefly to the growth of cereals, here produced over such vast areas of rich bottoms that it would seem possible for this region to serve as a granary for all of Europe.

At Budapest there is a national museum of very creditable standing, and in applied entomology Hungary duplicates more nearly than any other European State, perhaps, the system of government entomological investigation in vogue in the United States, although necessarily on a much smaller scale. The agricultural conditions of Hungary are very similar to those of the United States, and practically the same questions arise in the matter of destructive insects. The account of this bureau given by Doctor Howard fully brings out this condition of affairs. The place of government entomologist or director of the Royal State Entomological Station, formerly held by Doctor Geza Horvath, is now filled by Mr. Josef Jablonowski, who has two assistants, and carries on the work of the station in very meagre and poor quarters in a rented building near the palace of the Department of Agriculture. Two or three days were spent with Mr. Jablonowski in examining his methods of work and in running about the cities which have been combined under the modern name of Budapest. The work done in the Entomological Bureau is chiefly of an office character and largely by correspondence, which is systematized somewhat on the basis of the work carried on by our Statistical Division of the Department of Agriculture. A large

corps of field observers send in replies gratuitously on printed forms relative to insect outbreaks, and advice as to remedies are sent out wherever needed. In special cases field investigations are undertaken, but the means at hand are limited, and such work is not very large in extent. The hours of work are the same as at Vienna—from 9 to 2 o'clock. Although no inquiries were made on the subject, it is probable that the salaries are small, judging from the fact that in the army a lieutenant receives from six hundred to a thousand gulden, or from two hundred and forty to four hundred dollars a year. The work, good as it is, is often hampered by the ignorance in scientific and practical matters of the Minister of Agriculture. One example of the result of this may be noted: A rather more serious outbreak than ordinary of the well-known grape pest (Cochylis) was reported over a wide territory, and there were consequent fears that the vine industry was seriously threatened. Although this insect is a common one and well known to viticulturists and entomologists, and one which has been studied and the methods of procedure against which have been exploited for years, yet the statement of these facts had little weight with the Minister of Agriculture, and the entomologist, Mr. Jablonowski, was commanded to immediately exterminate the insect in question. On explaining that this was impossible with the means at his command, he was peremptorily told to destroy the insect and do it within a week.

In the laboratory of Mr. Jablonowski were seen a number of interesting insects not yet known in this country, the introduction of which would be attended with very serious consequences to our agriculture. Perhaps the worst insects appearing in Hungary in recent years are the clover-leaf Apions, represented by two or three species of this genus,* which scarify and defoliate the leaves of the clover to such an extent as to nearly ruin it for purposes of forage or cropping These insects seem to be rather general feeders, and are often, for instance, very destructive to the foliage of the fig. The migratory grasshopper of southern Europe is also one of the principal destructive insects of Hungary, and the operations against it are very extensive, but are chiefly of the mechanical sort. The locusts are driven into temporary inclosures and there destroyed wholesale, as has often been illustrated

* *Apion trifolii, A. assimile, A. apricans.*

and figured in publications with which our American entomologists are familiar. In the large agricultural museum, a relic of the recent exposition at Budapest, is a relief model illustrating this method of work. The Phylloxera has become pretty well distributed throughout Austro-Hungary, but, as stated, is kept very well in check, and is no longer especially feared. The methods of control practiced are, in the order of their importance, as follows: (1) planting in sand or gravel; (2) use of bisulphide of carbon; (3) the employment of American stocks. It will be seen that the usual order in point of value of these remedies is reversed.

In the matter of forest and shade-tree insects, a great deal of indifference is exhibited which is surprising, as one is led to believe that in Europe such matters are carefully looked after. The maples along the principal streets of Budapest are being much injured and often killed by the attacks of *Zeuzera pyrina*, the maple borer, which has recently gained lodgment in this country, and although the attention of the authorities has been called to the matter repeatedly by Mr. Jablonowski, no steps whatever have been taken to check the damage. Among other insects which have recently proven very destructive in parts of Hungary, and which would be especially dangerous to our wheat districts, is a leaf beetle (*Lema melanopus*) which skeletonizes the leaves of wheat and other small grains.

In the methods of controlling injurious insects, practically the same steps are followed in Hungary as are generally employed in this country. The arsenicals are not of the kind used here but are essentially the same. Soap and milk emulsions with petroleum are standard insecticides, but perhaps greater confidence is put in tobacco solutions, especially for the treatment of young forest growth as a protection from caterpillars. The confidence expressed in the protective action of tobacco solutions seems, however, hardly warranted by our experience with this substance. Mr. Jablonowski, differing from his compatriots at Vienna, spoke favorably of insect-lime, which he reported to be of value against travelling worms, and especially a brand manufactured at Prague, which retains its fluidity much longer than others.

The Royal National Museum of Budapest, already referred to, has, as custodian of the zoölogical section, Doctor Horvath, who

for a number of years was in charge of the State Entomological Station. Associated with him are some six other zoölogists, three of whom are working in the entomological section. The entomological collections, while not yet very extensive, and much cramped for space, are very creditable. Much zeal is also manifested in the collection of exotic insects, and at the present time the museum has a collector in New Guinea who is sending in a vast amount of material, most of which is undescribed, and represents the minuter forms of insect life. A good deal of careful scientific work is being done here, and, fortunately for the rest of the world, published, for the most part, in Latin. Mr. Alex. Mocsary, Custodian of Hymenoptera, who is remembered very pleasantly, has been especially active in the preparation of papers and monographs, notably a monograph of the Chrysididæ of the world.

Leaving Budapest, the writer passed, without stop, through the rather flat agricultural territory of Hungary, over the Hungarian National Railway, to Fiume, and thence to Trieste. The topographical features and the agricultural conditions of this part of Hungary present little that is distinctive, and strongly remind one of the similar districts in the States of the Mississippi Valley.

Fiume and Trieste are surrounded with broken, mountainous country, not differing particularly from northern Italy. The Italian race predominates, and the cultures are those of Italy.

More time was spent in Italy than in any other country, and the conditions, from an agricultural and fruit-growing standpoint, as bearing on the subject of affecting insects, were here more carefully studied than elsewhere. The same remarkable freedom from insect enemies noted elsewhere was found throughout Italy. In northern Italy, under the protection of the barrier Alps, and particularly in the region of the Italian lakes, olive and lemon culture is much in evidence. The latter is carried on most extensively, perhaps, on the sheer sides of the mountains rising from Lake Garda, under conditions which amount to house culture; in other words, winter protection of the trees is necessary for their safety. No more picturesque sight is to be seen anywhere in Europe than these steep mountain sides lined over large areas with curious lemon houses, open in summer and closed in

winter, and presenting conditions which would seem to be the very ones most favorable for the presence of injurious insects.

Southward of this region lies the valley of the Po, with the flat, open country of Lombardy and Piedmont, which has practically a continental climate—cold and windy in winter—colder even than England at some seasons—and with sharp changes of temperature and a very humid atmosphere, and hot, in summer, as Sicily. Beyond the Appenines Tuscany and the region about Florence is reached, which is again a great wine and olive district, with the lemon and orange growing safely out-of-doors. The Campagna of Rome and central Italy is devoted largely to the growth of cereals and to pasturage. About Naples the vegetation is somewhat more tropical, and the citrus fruits, and especially olives, are extensively grown. In January it frequently freezes, and the orange and lemon groves which stud the sides of the precipitous mountains along the coast from Salerno, Amalfi, and Sorrento to Naples have generally to be protected in midwinter, usually by a hastily constructed shed covered with boughs of trees. The construction of these sheds was in progress everywhere at the time of my visit in November.

As careful examination was made throughout the region thus briefly described as was possible with the time at command for indications of presence of insects. With the exception of the olive-fruit fly, however, no insect damage of any moment was noted. Scale-insects were almost wanting, and this holds true even of the more neglected orchards and gardens where their presence would be manifest, if at all.

The principal entomological station of Italy is located at Florence, viz., the *Royale Stazione d'Entomologia agraria*, established in 1875. The director of the station, Prof. A. Targioni Tozzetti, was unfortunately absent during the week spent by the writer in Florence. The library, laboratory—if the meagre facilities provided may be so called—and the insect collections, both economic and systematic, are in the *Royale Museo di Storia Naturale*, Via Romana, 19, in connection with which Prof. Tozzetti fills the chair of Comparative Anatomy and Zoölogy of the Invertebrates, in addition to his duties as Director of the Entomological Station. Under the guidance of Prof. Tozzetti's museum assistant, Dr. Angelo Senna, a survey of the entomo-

logical rooms was made. The whole museum was being thoroughly repaired and refurnished, and the collections were not in shape to be seen to advantage. In the biological and economic series the display was not especially remarkable, and the systematic collections are also not of great interest, though containing Rondani's types of Italian Diptera. The practical experimental work is conducted by Dr. Giacomo del Guercio, who is the chief assistant in the entomological work of the Royal Station, and is also charged with the experimental work as well as the instruction in entomology, vegetable pathology, etc., which is carried on at the Royal School of Pomology and Horticulture, at Florence. This school, which was established in 1882, and has for its object the training of young men as experts in pomology and horticulture, was in session at the time of my visit, and was interesting as an Italian analogue, in a way, of our State experiment stations. A large tract of land, devoted to fruit and vegetable cultures of all sorts, is attached to the school building, and the students, some thirty in number, combine, in a three years' course, the study in the school-room of the practical and theoretical subjects relating to pomology and horticulture, with experimental and practical work in the garden and orchard. These students become experts in horticultural and allied matters, including entomology, and, on graduation, scatter throughout Italy to assume charge of work in the lines covered in the different provinces. This station, with its extensive grounds, affords a splendid opportunity for experimental work in entomology, and Doctor del Guercio has accomplished as much, if not more, work in this line than any other Italian investigator. One of the characteristics of this school farm is that all field operations are designed to be self-supporting, and are made to yield a reasonable profit, which gives it a decidedly practical character.

In the entomological work soap washes are most highly esteemed, and are used against nearly all insects, and particularly for the scale-insects and plant-lice. The usual time of application is in the spring, Doctor del Guercio stating that at other seasons the leaves are apt to be killed by the mixtures. To an American entomologist the soap solutions employed by Doctor Guercio appear very weak and inadequate. His principal wash is prepared by dissolving three parts of soap in one hundred parts of

water. Slight variations of this wash are made by adding to it one part of the extract of tobacco, or one part of potash. Another wash, which is recommended for such grape insects as the Pyrale and Cochylis, has also soap for its ingredient, and is prepared as follows: Soap, three parts, dissolved in one-half of one part of alcohol, to which is added one and one-half parts of benzine, and the whole combined with one hundred parts of water.

As already noted, the great crops of the region about Florence are the vine and olive. The former is grown throughout Italy, in rows, trained on trees or on very high trellis-work, and is rather carelessly cultivated and apparently very liable to insect attack, especially when trained on trees which furnish very convenient winter retreats for the chrysalids of the Cochylis or the larvæ of the Pyrale. The chief enemy, the Phylloxera, is kept in check by the use of American stocks, and planting in sandy or gravelly soils.

The olive finds its principal enemy in the olive-fruit fly, which Doctor del Guercio's experiments, he says, have demonstrated to be subject to control. Since this insect winters in the pupa state, either on the ground or near the surface, he has found that deep plowing at any time from January to May will very materially limit the pest. Nevertheless, this insect is present nearly everywhere, and the loss from it is necessarily great. Of other insects little account is taken, and not much damage is reported. Yearly examinations are made for such wood-boring insects as Scolytids, and the soap solutions mentioned above are used for the leaf-feeding insects. Egg-masses are carefully collected and destroyed in the winter.

In nearly all the principal towns in Italy are Royal Universities, most of which have a zoölogical section and museum, with a director or professor in charge. Prof. Carlo Emery, the well-known student of the Formicidæ, is thus connected with the Royal University of Bologna, and Prof. Achille Costa, for nearly forty years, has been similarly connected with the Royal University of Naples, and Director of the *Museo Zoölogica.* Unfortunately, opportunity did not offer to meet either of these men. The latter museum is chiefly interesting as containing the types of the genera and species described by Prof. Costa during the last half century in his "*Fauna del Regno di Napoli.*"

There is little to be said of the economic entomology of Naples and vicinity. *The Royale Scuola Superiore di Agricoltura*, at Portici, a suburb of Naples lying under the shadow of Mount Vesuvius, was visited, but, unfortunately, both the well-known entomologist, Professor Antonio Berlese, who holds the chair of General and Applied Zoölogy, and his assistant, Dr. Leonardi, were absent, the former for an indefinite period, so there was no opportunity of adding to the writer's information by personal acquaintance or conversation with either of them.

The school is housed in the old Royal Palace, built by Charles III in 1738, and the somewhat neglected gardens and grounds attached furnish limited means for experimental work. There are comparatively few students.

Attention has already been called to the freedom of the olive and lemon groves, which abound along the Italian coast of this region, from injury by scale-insects.

An examination, also, of the fruit in the market, some of which comes from near-by sources, and also from more southern districts and from Sicily, failed to show any indication whatever of the presence of scale-insects. In other words, the same immunity from these pests was found at Naples which had been noted elsewhere.

Of interest, perhaps, to our lemon and orange growers were some of the incidents connected with our departure from Naples. On boarding our ship, one of the German Lloyds liners, we were delayed some hours by the loading of freight, which was almost exclusively lemons and oranges nicely boxed, and conspicuously labeled, "Queen of California," "Riverside," "Santa Barbara," and other equally familiar names, recalling our Pacific citrus districts. Much of this fruit, in fact most of it, was from Sicily, and was being transhipped at Naples for the American market. It included, among others, the "Naval" orange, which is now being grown considerably in Sicily and Italy, and which, as found in the markets of Naples, proved to be nearly, if not quite, equal in flavor to the California product.

Advantage was taken of the fact that the steamer touched at Gibraltar, to drop off, between boats, and spend a week in exploring southern Spain. From the standpoint of the entomologist, and especially for the writer, this region proved to be peculiarly

interesting, from its great similarity in every particular—climate, fruits, conditions of cultivation, etc.—to southern California. The region visited was limited to the ancient Moorish provinces of Seville, Cordova, and Granada, or what is generally known as Andalusian Spain. A brief reference to the climatic, cultural, and crop conditions of this part of Spain will facilitate an understanding of its status from the standpoint of the entomologist. This region is shut off from the colder northern table-lands by the Sierra Morena mountains, and most of it is subtropical in character. The climate is much finer than that of Italy, cooler and more bracing, especially in the higher districts about Ronda and Granada. The richer parts of this district are represented by the great valley of Guadalquivir and the Vegas of Granada. The olive, grape, and citrus fruits are the staples, the latter being best represented in the southern and eastern coast region from Malaga northward. The methods of culture have changed very little from a time much antedating the Roman period, and to-day, very generally, implements are seen in use in the fields closely resembling those described in the ancient writings of the Egyptians and Hebrews. Since the time of the Moors, much land formerly in a high state of cultivation has gone back to a state of nature, and this is especially true of the region about Gibraltar and Algiceras. A prominent feature of the landscape everywhere is the agave, which is grown in dense rows as a hedge plant. In recent years there has been somewhat of a revival in agriculture, due to the breaking up and distribution of the church lands and the building of railroads, and some modern methods have been introduced. English machines, and even steam-plows, have been experimented with. The country, as one travels through it, seems to be uninhabited by the farming communities. There are vast cultivated fields, but no dwelling-houses or other signs of human habitation. Village life is the predominant one, and little assemblages of tile-covered cottages dot here and there the vast regions devoted to the olive, grape, and cereal cultures. The climate, like that of California, presents a hot, dry summer, during which the rivers become dry ravines, but in the rainy season, in winter, are converted into torrents. Much of the land is cultivated only by means of irrigation, and this is seen, in its best form, in the vegas of Granada. Irriga-

tion, however, is not necessary for the growth of the olive and the vine. The system of pruning adapted for the latter, so far as observed, is what may be called the stump plan; that is, as soon as the grape is gathered the vines are cut away, leaving a mere stump which projects only a foot or so above the ground, and resembles, more than anything else, a big-headed bludgeon rooted in the earth. This system of culture is particularly unfavorable to the multiplication of injurious insects, because all of the vine and leaf growth is yearly removed, leaving nothing but barren stumps, which furnish little or no protection for, or means of harboring, injurious insects over winter.

The great fruit crop, however, throughout Andalusian Spain is the olive, and for hours, even days, the train passed through mile after mile of olive orchards in unending succession, covering plains, hills, and mountains; all in excellent state of cultivation; all trimmed and low-headed in the same manner, and presenting a most pleasing appearance, and an efficiency in methods and care not witnessed elsewhere in Europe. The most celebrated olive orchards are in the province of Cordova. The harvest begins in November or earlier, but at the time of my visit, at the end of this month, much of the fruit was still ungathered, and many of the trees were almost black with the ripening olives. Everywhere the trees presented the same beautiful appearance—low-headed, like the basket willow, so that the fruit may be easily gathered, and contrasting markedly with the Italian and California method in this respect, which allows the trees to grow as they will. Many of these orchards, most of them in fact, are of great age. The immense old gnarled trunks gave sufficient indication of this when they remained entire; but often they had split and divided into three or four trees, which, in centuries perhaps, had grown apart until they looked like miniature groves. Everywhere the same brilliant, clean appearance was presented, and there was no indication of the chief scale enemy of the olive (*Lecanium oleæ*), with attending sooty discoloration of the branches and foliage. These old orchards, some of them perhaps dating from the time of the Moors, if not earlier, have never received any treatment to protect them from scale insects, and their immunity is solely to be explained by the peculiar conditions of the climate, particularly the extreme dryness of the long

summers. The only important enemy of the olive throughout all this region is the olive fruit fly, already noted in Italy, which, at times, is a very grievous pest, and vastly injures the crop. Nevertheless the olive industry is a profitable one, as shown by the care given the existing plantations, their vast extent, and also the fact that new plantings are constantly being made. The Spanish olive oil, however, has not the reputation of the Italian oil, and as a result much of it is shipped to France and Italy, and there, perhaps, after some slight special treatment, is sent out as Italian oil. Locally it brings about 1 peseta per pound for the best oil, and the pickled olives bring about the same price per pound; the peseta, at the present rate of exchange, representing a value of 15 cents. In view of the immense quantities produced this seems a good price. Italian oil, in this country, ranges from 40 cents per pound upwards, and our California oil is much dearer.

The chief citrus districts, which border the east and south coasts, were not visited, but throughout the region traversed were numerous orchards of lemons, oranges, and mandarins, and in all the old gardens and the grounds of the palaces were miscellaneous collections of semi-tropical plants, including many oranges, mandarins, etc. A very careful examination was made of the trees in the gardens of the Alcazar, at Seville, and the grand court of oranges of the mosque of Cordova, the trees in which date from the sixteenth century, and also the gardens of the Alhambra, and, to the writer's amazement, in none of these gardens, many of them neglected and often presenting conditions particularly favorable for scale insects, were there any special indications of injury, either at the moment of examination or at any previous time, by the common scale pests of these trees.

WORST INSECTS.

In referring briefly to the worst insect pests of Europe, only those species which come under personal observation, or about which information was personally gained, will be noted. This section will therefore be a brief one, as it is not proposed to draw on the literature for matter.

In the portions of Europe where opportunity was had to make

anything like a thorough acquaintance with the conditions, the grape was the chief fruit crop, and this includes France, northern Italy, and much of Spain. Throughout all this region the grape has three important insect enemies; all the rest, and there are many, are seldom especially injurious, and are more often interesting as rarities than as possessing any economic importance.

The three species in question are the Phylloxera, the Cochylis, and the Pyrale. Owing to the lateness of the season there was little to see of these insects, but many of the entomologists met had something to say of them.

More need not be said of the Phylloxera than has already been given in the foregoing pages. Their possible importance to grape growers in this country warrants devoting a few words to the other two species. The Cochylis (*Tortrix ambiguella*) is the European representative of our grape-berry moth (*Eudemis botrana*). The first generation attacks the flowers, and if the blooming season is delayed by cold weather much damage is often done; the later generations attack the grapes—one larva destroying several, and in some seasons the loss amounts to three-fourths of the crop. In the hibernating season only would this insect be apt to be brought to this country, and the habit of this insect during this season greatly diminishes this danger, and perhaps accounts for our apparent freedom from it so far. About the end of October the last generation of larvæ spin up and transform to the chrysalis state on the old vines or in cracks of the vine posts, and, wintering there, are little likely to be transported on cuttings or young stock. The remedies are, gathering the fruit early while it still retains the larvæ; wetting the vines and stalks with hot water, which, to be successful, must be done in October, before the transformation to chrysalis takes place; and for the first brood, spraying the flowers or fruit only with pyrethrum and soap solution.

The Pyrale (*Tortrix pilleriana*) is another small Lepidopteron, very destructive in Europe but not known in America—perhaps here, again, on account of the hibernating habit not favoring its transportation. In July the eggs, to the number of 60, are deposited in a small mass on the upper surface of the leaves. The larvæ hatching in August swing down by a thread against the vine stalks and make a slight burrow and cocoon in the bark, in

which they pass the winter, very much as does our peach-twig borer. In the spring the young larvæ emerge, also like the last, and burrow into the young leaf-shoots, and feed on the leaves and young growth and fruit.

It is against this insect that the winter hot-water bath is most successfully employed, and excellent apparatus are constructed by Vermorel and others for the heating and application of the water. The treatment is on warm days in January or February after pruning, and with the water at a temperature of at least 92° Centigrade. In the south of France, about Montpellier, the pruned vines are covered with a zinc vessel and submitted to the fumes of burning sulphur for five to ten minutes. The egg-masses may be collected as a summer procedure. The cost of the water bath is about 17 francs per hectare (2½ acres), and of fumigation about 30 francs.

I have mentioned these two grape insects particularly because of the great importance of preventing their introduction into the United States. It is, however, true that many of the other grape insects of Europe might act altogether differently over here, and become quite as serious pests as the ones especially mentioned.

After the vine the fruit of greatest importance in southern Europe is the olive, and this, in the writer's experience, presented but one serious insect pest, viz., the fruit fly (*Dacus oleæ*). This insect occurred everywhere, often infesting every fruit, and while, in Italy for example, it was asserted that it could be controlled, it was very evident that it was far from being kept in subjection, and it was admitted that very little was attempted in this direction on the part of the ordinary grower. In exported olives, for sale in our stores, fruit absolutely free from this pest is rare, and in the cheaper grades frequently every olive will be pierced with the small hole made by the larva of this insect or eaten about the pit.

The olive fruit fly, as already stated, winters in puparia on or near the surface of the soil, and it is affirmed that deep cultivation between January and May will bury it beyond escape.

Very fortunately for our California olive growers this insect has also, so far, failed to reach our shores, nor does the likelihood of its introduction seem great. The thing to guard against most zealously is not to bring cuttings with soil from about living trees or plants with soil from infested localities.

Of the citrus fruits and their enemies in the regions visited, the general results of the examinations made have already been given. Of insects affecting cereal and forage crops, the lateness and the exceptional character of the season prevented any observations being made. This applies also to vegetable and truck crops. Attention may again be called, however, to the insects especially noted in the remarks on Hungary, and the work of some interesting species which were seen in the laboratory of the Government Entomologist at Budapest.

CONCLUSIONS.

In reviewing the foregoing notes one feels a considerable hesitancy in drawing general conclusions, so hastily was the trip taken and so fragmentary were the observations. The season was also exceptional, and, furthermore, it is a trite fact that insect damage or abundance is subject to extraordinary yearly fluctuations. With other years, or more normal seasons, the conditions might have been somewhat different; but, nevertheless, in the main, I believe the conclusions are just, and represent a fair, average condition.

It is to be borne in mind, however, in the reference to the little need or absence of efforts to control injurious insects, that the grape is always to be excepted, for throughout southern Europe it is subject to more or less careful treatment to protect it from both insect and fungous enemies, and is the one fruit in connection with which the European and American meet on the same terms, or with the advantage rather on the side of the latter.

The fact, often pointed out, that the need of entomological investigation, from an economic standpoint, is not felt in Europe to anything like the same degree as in the United States, received notable confirmation in my personal experience, for with the exception of the damage from the olive fruit fly in Italy and Spain, I did not see a single marked case of insect injury during my trip. It is true the season was particularly unfavorable for insect abundance. There was a great deal of rain, and it was unusually cold, and, what is more, the winter set in much earlier than is the rule. The freedom from insect damage was especially noteworthy in the olive orchards from northern Italy southward to

Naples, and also throughout southern Spain, and, so far as the foliage and twigs of the trees were concerned, a clean, bright, and healthy appearance was uniformly noted, as though they had never been subjected to any insect attacks whatever, and this notwithstanding the fact that many of the trees were seemingly several hundred years old. In other words, there was no indication of special damage by scale or other insects. This is certainly in strong contrast to conditions noted by the writer in California, where, under similar circumstances, the olive and citrus trees are often infested and blackened by the presence of *Lecanium oleæ* and other scale insects. The excellent condition of the olive and citrus groves, particularly the former, of Europe is not due to any special care given them. In fact, it is to be doubted if any of them, in the regions visited, have ever been treated in a general way for insect pests. Their freedom from scale is also not explained by the absence of the insect itself, because the discovery of rare examples here and there, and especially in old gardens, was sufficient to prove its occurrence, if the fact were not otherwise well known. What has been said of the olive applies with equal force to the citrus fruits, and, in a general way, to other fruit and forest trees.

For most of Europe the conviction is forced upon one that climate has more to do with this immunity from insect enemies than any other agency. The cooler and shorter summers of middle Europe, comparable to our fall or early winter, almost, do not foster the multiplication of insects as do our longer and very hot summers. This can hardly apply with equal force to Spain, at least to the olive and citrus districts. Here, however, it may be inferred that the extreme dryness and heat of the summers may have the effect of keeping scale insects in check, as do the same influences in exceptional seasons in California. On this side the Atlantic it may be that the greater moisture, in connection with the long, hot summers in Florida, the West Indies, and the coast region of California, is the predisposing cause which leads to our serious affliction with scale insects.

The writer is rather inclined to doubt, also, the belief, frequently expressed, that parasitic and predaceous enemies are extraordinarily important in Europe, at least so far as the enemies of fruit trees and cultivated plants are concerned. That they are more

efficacious in preventing excessive damage by insects affecting forests may be true, but even here it is to be questioned if the results are much more favorable than often occur on this continent under similar conditions.

That there are insect outbreaks of a serious nature in Europe goes without saying, but, in the main, they are local, and usually die out naturally after two or three years. These remarks do not apply to the two great insect scourges of southern Europe, viz., the Phylloxera and the locusts, the former now infesting most of the vine regions of Europe, and the latter being often destructive to crops in southern Europe and northern Africa. Nevertheless, the general effect, and a very strong one, which the examination of the conditions made on the writer was that Europe is singularly free from damage by insects. For example, where a few scale insects were discovered or pointed out by local entomologists, they were so few in number and insignificant altogether as to be hardly worth considering, except as an indication of their actual presence, with attendant possibility that they might become destructive at some future time.

In the matter of the treatment of destructive insects it would appear, also, that we have little to learn or to gain from a study of the European methods, for the simple reason that injury is so much less frequent and less serious that wholesale and radical methods of control, such as are often necessary here, are seldom or never employed. This applies especially to the scale insects.

In estimating the value of this hurried examination of the condition of affairs in applied entomology in southern Europe, the writer personally sees the greatest benefit, perhaps, in being able to more correctly appreciate the facts of climate, forest growth, and methods of culture of fruits, etc., obtaining there, or, in other words, to exchange the hazy ideas formerly had of European conditions for more accurate knowledge. Without personal acquaintance it is out of the question, except in a general way, to get an intelligent grasp of methods of work followed in Europe, or to determine their applicability to our own conditions, which, while apparently often similar, are frequently altogether different.

In discussing the address, Mr. Fernow said that in his opinion the retiring president had taken too optimistic a view of the insect

conditions in Europe. Certainly in north Germany the absence of insects in the forests is not due to climatic conditions or to rarity of the insects *per se*, but it is undoubtedly due to the great care taken to prevent insect outbreaks. He showed the extreme watchfulness of the authorities at critical times of the year, and entered into some detail.

Mr. Schwarz agreed, in the main, with the last speaker, and said that this was undoubtedly the case in the portion of Germany in which he had lived. Insects, normally, are just as abundant as here in this country, but are kept in check by preventive measures. He agreed, however, to a certain extent, with Mr. Marlatt, in considering that the climate is less favorable than that of the United States for the development of great swarms of injurious insects.

Mr. Benton, speaking along the same line, said that he had lived four years in Germany; that the peasants of the country are driven to the utmost economy in order to enable them to live. Every twig is picked up. In the fields anything which can be fed to domestic animals is gleaned, and thus little opportunity for injurious insects to increase is afforded. He thought, however, that the climate was considerably less favorable than that of this country. He raised bees at Munich during his stay, and the weather was often so cold in midsummer that considerable protection was required to prevent loss of brood by chilling. He noticed that the insect enemies of bees were very scarce.

Mr. Howard expressed great interest in the address, and moved a vote of thanks to the retiring president, which was adopted by a rising vote.

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132 February 10, 1898.

Vice-President Gill occupied the chair, and Messrs. Schwarz, Waite, J. B. Smith, Cook, Heidemann, Busck, Pratt, Chittenden, Ashmead, Motter, Banks, Benton, Patten, Howard, Swingle, and Fairchild also present.

The following new members were elected: Corresponding—V. H. Lowe, Geneva, N. Y. Active—C. L. Pollard, National Museum; H. J. Webber, Department of Agriculture.

—Mr. Schwarz presented the manuscript of Ulke's list of the Coleoptera of the District of Columbia. On motion, the matter of publishing this list was referred to the Executive Committee with power to act.

—Under the head of "Exhibition of Specimens," Mr. Ashmead showed a male and female of *Hypota pectinicornis* Latr., a species occurring in South Europe and Algiers, of which the male has flabellate antennæ. This is the only Chalcidine genus, except Hybothorax, which has such antennæ.

—Mr. Schwarz exhibited specimens of the cocoons of *Cactophagus validus* Lec., taken from the trunk of the giant cactus at Tucson, Ariz., by Mr. Hubbard. In each of these cocoons collected in winter time are to be found from 30 to 80 dead and mutilated specimens of a Colydiid beetle—an undescribed species of the genus Bothrideres. This is a curious case of symbiosis, since it seems that none of the Bothrideres which have developed in the cocoons can escape therefrom. The Bothrideres larvæ are evidently parasitic on that of Cactophagus; another species is known to develop within the larvæ of the Cerambycid *Lagochirus araneiformis* in the West Indies.

—Mr. Pratt exhibited a specimen of *Lachnosterna inversa* from Keokuk, Iowa, collected by Dr. Shaffer, which carried on its thorax two parasitic eggs like those found by Mr. Howard in the Catskill Mountains and exhibited at a previous meeting of the Society. Dr. Smith stated that he had never seen such eggs during his extensive studies of the species of Lachnosterna, in the course of which many hundreds of specimens were examined.

—Mr. Fairchild exhibited a Phyllium from Java which closely resembles the guava leaf. He also showed a striking photograph of a mantid which mimics the coffee flower. Some discussion ensued as to the attitudes of the leaf insects and tropical mantids when disturbed. Mr. Fairchild said that the leaf insects move very slowly, and, when touched, throw the legs out at an angle to the body. Mr. Cook said that in Liberia the young mantids carry their abdomen erect or bent over to the thorax. One form, with reduced wings, and colored like a lichen-colored tree, instead of menacing with its front legs when alarmed, flattens out close to the bark in an effort to escape observation. Another species, colored like a flower, drops to the ground with a circular motion, closely resembling a flower when falling.

—Mr. Banks exhibited a specimen of *Tetragonophthalma dubia* Hentz, collected in the District of Columbia, which brings a new family of spiders into our local fauna.

—Mr. Schwarz showed the seeds of the sea grape of Florida, *Coccoloba uvifera*. Hitherto no beetles were known to affect this plant, but Mr. Hubbard has recently bred *Pseudomus inflatus* from the seeds at Miami, in semi-tropical Florida. Mr. Schwarz showed specimens of this weevil. Mr. Swingle remarked that the sea grape will shortly become of economic importance.

—Mr. Swingle further announced that the plant-lice in the greenhouses of the Division of Vegetable Pathology of the Department of Agriculture are now being very extensively parasitized by Aphidians. The process of oviposition can be readily observed.

—The first paper of the evening was by Dr. J. B. Smith, and consisted of a discussion of recent papers on Hemipterous mouthparts by Dr. Leon and Dr. Heymons. Dr. Smith discussed both of these papers at length, showing how, in his opinion, the points brought out by these writers substantiate his position that the Hemipterous beak is a maxillary structure, although both authors worked on the assumption that it is labial. This paper was briefly discussed by Messrs. Cook, Banks, Howard, and Gill, all taking issue with Dr. Smith's conclusions.

—Mr. Banks read the following paper:

TARSONEMUS IN AMERICA.

By Nathan Banks.

The genus Chironemus was erected in 1875 by Canestrini and Fanzago for some soft-bodied mites found in colonies on leaves after the manner of Tetranychus. The name being preoccupied, the authors changed it the following year to Tarsonemus. The forms have considerable resemblance to certain Tyroglyphids, but differ from that family in the possession of trachæ, and in having a clavate projection between the legs of the first and second pairs. In 1877 these authors made the genus the type of a new family, placing in it the genus Pediculoides (Heteropus) and some allied forms. These genera have marked sexual differences, but not a very remarkable life-history. In Tarsonemus, the female has a long elliptical body, and the fourth pair of legs is very slender, tipped with two long hairs, and destitute of claws. In the male the body is truncate behind, and the fourth pair of legs is stout and armed at the tips with two stout curved spines.

Tarsonemus lives on the leaves of shrubs and herbs, sucking the juices of the plant. Several species are known in Europe: *T. oryzæ* injures rice in Italy, *T. buxi* lives on box, *T. floricolus* occurs on various field plants, and *T. krameri* is found in Germany, in small galls on certain grasses. Mr. E. E. Green has recorded *Acarus translucens*, which is evidently a Tarsonemus, as injurious to the buds of the tea-plant in Ceylon.

Some time ago, Mr. F. A. Sirrine, of the Jamaica branch of the N. Y. State Agric. Exper. Station, sent me for determination some mites found in abundance on the leaves of chrysanthemums in a greenhouse. They proved to belong to Tarsonemus, and, as they differ from the known forms, I propose to describe as

Tarsonemus pallidus, n. sp.

Pale greenish hyaline. Body (♀) elliptical, the mouth-parts slightly projecting in front; at tip it is indented in the middle and a little each side, showing on the under side two lobes, before which is a short transverse line. Legs I and II subequal, rather longer than width of body behind the second pair, a bristle on the outside of last two joints of leg I and one on the inside of last joint, one on outside of the two intermediate joints of leg II; III legs about as long as width of body in middle, one bristle on last joint and three on next to last; IV pair very slender,

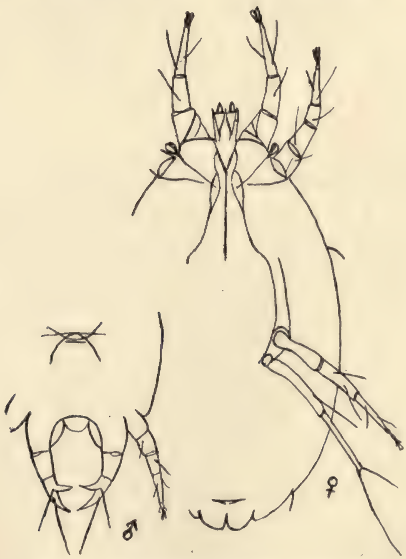

FIG. 17.—*Tarsonemus pallidus*,—enlarged. (Original.)

scarcely as long as III legs, one long bristle on next to last joint, and two at tip of last joint, the inner one longer than the joint; body with a bristle each side slightly before the middle, and one each side near the tip. Body (♂) rather quadrate; venter with a transverse line on middle, and a yoke-shaped mark; legs I, II, and III subequal, rather shorter and stouter than those of the ♀; IV pair shorter and stouter, at tip of body, tipped with two stout claws, the outer one the larger and longer, and two bristles, the outer one much the longer.

Length ♀ 1.1 mm. ♂ .75 mm.

On leaves of chrysanthemums in a greenhouse near Jamaica, N. Y.

Mr. Cook, under the title of "A New Family of Diplopoda" from Alabama,* described *Desmonus earli*, and the new family Desmonidæ.

At 10 o'clock the Society adjourned.

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132 MARCH 3, 1898.

Vice-President Gill occupied the chair, and Messrs. Benton, Schwarz, Dyar, Ashmead, Busck, Currie, Heidemann, Stiles, Kenyon, Pratt, Marlatt, and Howard were also present.

The Chairman announced the death of the only Honorary Member of the Society, Professor Rudolf Leuckart. The Secretary was authorized to express the sympathy of the Society to Mrs. Leuckart.

—Dr. Stiles moved that the Chairman appoint a committee to protest to the International Committee on Zoological Nomenclature against the majority report of that committee and in favor of the minority report. The motion was carried, and the Chairman appointed Messrs. Ashmead, Schwarz, and Howard. On motion, Dr. Stiles was appointed to represent the Society at the meeting of the International Committee.

—Mr. Ashmead was nominated Vice-President of the Washington Academy of Sciences for the Entomological Society.

—Mr. Schwarz exhibited specimens of the larvæ, pupa, and imago of a very little known Coccinellid beetle, *Thalassa montezumæ*, and read the following abstract of a letter from Mr. H. G. Hubbard, dated Wilcox, Arizona, May 27, 1897, regarding its food habits and economic importance:

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*Included in a paper entitled "American Oniscoid Diplopoda of the Order Merocheta," and published in Proc. U. S. Nat. Museum, 1898.

ON THALASSA MONTEZUMÆ MULS. (FAMILY COCCINELLIDÆ.)

By H. G. Hubbard.

About 12 miles out of Wilcox, Ariz. (just where we begin to ascend from the great plain of Sulphur Springs Valley to the foot-hills of the Galiuro Mountains, Winchester range), the mesquite bushes along the road were entirely covered with a huge Lecaniid scale (*Toumeyella mirabilis* Cock.). This Coccid is covered with large pores which give out such an abundance of excretion that it hangs down in long drops and pendants from the Coccids, a yellowish, turbid, viscid liquid, resembling glucose, and drying up into a sort of candy. This honey-dew is, however,

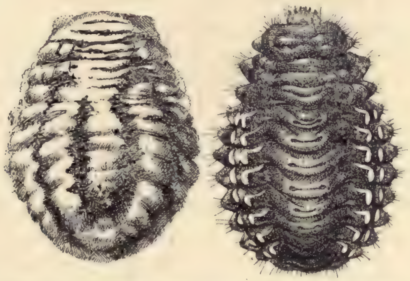

Fig. 18.—*Thalassa montezumæ.* Left-side figure, larva with waxy covering; right-side figure, larva with the covering dissolved—enlarged. (Original.)

not very sweet, but has a very strong smell and a disagreeable taste, which I have noticed in many seeds of exotic Acacias, particularly those from Australia.

Feeding upon this Coccid, or upon its young or upon the exudation, were numbers of larvæ of a Coccinellid which resemble marvelously a Dactylopius of the very largest size. The body is very broadly oval, in fact almost as broad as long, with prominent lateral tufts of white wax, and with a median ring of smaller tufts; on the center of the disk are two or three isolated tufts, more or less evanescent, and leaving a dark central space, which is very characteristic. When touched, these larvæ emit large drops of fetid, orange-colored exudation.

I could find no imagos of this Coccinellid on my way out (May 20th) to the Galiuro Mountains, but on my return (May 26th) I inspected again the same mesquite bushes. I found then that most of the Coccinellid larvæ were just beginning to pupate, which they do sometimes in clusters on the stems, in which case they greatly resemble the Coccid; but more frequently singly on

the green leaves. I took a large series of the pupæ, which are red-brown with obscure darker markings of umber-brown. The larval skin is either entirely gone from the pupa above, or the pupæ are only covered with a few fragments of the larval skin, and only the ventral parts of the skin remain as a flattened surface upon which the pupa rests.

Only a small number of imago beetles (*Thalassa montezumæ*) could be found, many of them just matured but still within the split skin of pupa. It is a large and powerful species, and I saw several of them feeding ravenously upon the Coccids and eating them bodily. As to the larvæ, they appear rather sluggish, and I could not detect them eating the mature Coccids. It may be that they eat only the young or the excretion.

However, I wonder if this Lady-bird would not prove an effective enemy of the Black Scale (*Lecanium oleæ*) if introduced into the olive orchards of California. I have mailed a large tin box with a lot of pupæ, most of which will have disclosed by the time they get to Washington, if they are not crushed.

Mr. Schwarz added that the Mexican *Thalassa montezumæ* had never before been found within the United States, the locality "New Orleans, La.," given by Mulsant, being evidently erroneous. More recently, Dr. Horn had recorded it from the Cape region of Baja California. The species is apparently a hardy one, and able to stand transportation to long distances, since all larvæ and pupæ mailed by Mr. Hubbard reached Washington safely. Among them a few specimens of another Coccinellid larvæ were found which proved to belong to one of the numerous varieties of *Hyperaspis undulata.*

—Mr. Pratt exhibited the moth of *Xylina ferrealis*, taken February 28th, this year. New York was the most southern point previously recorded for it.

—Dr. Dyar showed living larvæ of *Calybia slossoniæ*, from Florida, feeding on mangrove leaves.

—Dr. Kenyon read two notes of recent discoveries: A bacillus parasitic on Phylloxera, and the production of immunity against the bite of the viper by injection of the poison of Vespidæ.

Dr. Stiles discussed the former, saying that the use of Bacteria in economic questions had been frequently productive of undesirable results.

—The first paper of the evening was by Dr. Kenyon, and was entitled "A New Diplopod from Mexico."

A NEW MEXICAN DIPLOPOD, DECAPORODESMUS MOTZORANGI NIS, TYPE OF A NEW FAMILY, DECAPORODESMIDÆ.

By F. C. KENYON.

The single specimen upon which this description is based was found in a lot of myriapod material collected by Mr. Lawrence Bruner in Mexico. The specimen is about 8 mm. in length, relatively slender, of a warm, brown color above, and lighter below, and with peculiar structural characters that readily distinguish it from all other known American diplopods. The segments are of the usual number found in the polydesmid group, but relatively short and loose. Or, in other words, the intersegmental membrane is prominent. The lateral carinæ are prominent, not decurved, and with the outer margin provided with a median notch that gives it a bituberculate appearance. In the first segment, which is large, they unite in front so as to form a broad plate overhanging and completely concealing the head. The margin of this plate is provided with ten tubercles. In the second segment the carinæ project forward, and the outer margin is trituberculate. The rest of the carinæ project outward. Towards the posterior extremity they incline more and more backward until in the last segment they unite behind, forming a pointed marginally 5-tuberculate plate overhanging the anal plates. Dorsally there are two rows of bi- and tri-tuberculated carinæ that increase in height posteriorly. In the antepenultimate segment the two rows converge, and in the penultimate segment become united, so that this and the last segment have a single crest-like process projecting considerably backward. Between the dorsal and the lateral carinæ are two rows of simple tubercles, the inner row of which is most prominent.

The repuguatorial pores are distributed very peculiarly, occurring in the fifth, seventh, tenth, thirteenth, and fifteenth segments only. The pores are at the end of small white, conical, black-tipped stalks, arising from the posterior half of the outer carinal margin.

As in other polydesmids the first segment is apodous.

The general appearance, size, and the pore-bearing stalks suggest that the genus should be placed in the family Stylodesmidæ, erected by Cook for several Liberian diplopods. The pore formula, however, and non-concealed character of the last segment are different, and at once preclude the possibility of the animal's being classed as one of the Stylodesmidæ. Inasmuch as the pore formula is unique, and separates the genus from all other described forms, it is proposed that it be considered the type of a new family, Decaporodesmidæ, as well as of a new genus and species, *Decaporodesmus motzoranginis*.

Habitat, Motzorango, Mexico.

The paper was discussed by Dr. Gill, who suggested Oligodesmus as a more appropriate generic name. Also discussed by Messrs. Howard, Dyar, Ashmead, and Currie.

—Mr. Dyar presented a paper entitled—

IDENTIFICATION OF THE EUCLID LARVÆ FIGURED IN GLOVER'S "ILLUSTRATIONS OF NORTH AMERICAN ENTOMOLOGY."

By Harrison G. Dyar, Ph. D.

This work was not examined in time to include references to it in the "Life Histories of the New York Slug Caterpillars," which I have been publishing in the Journal of the New York Entomological Society. I therefore give a list of the Eucleid larvæ figured in it, with notes on those forms which have not been bred. Many of the larvæ were unknown to Glover by name.

Euclea delphinii Bdv. The larva is figured pl. 11, fig. 5. The figure pl. 10, fig. 21, seems to represent the same thing, perhaps immature and parasitized.

Euclea indetermina Bdv. Larva, pl. 11, fig. 8, and pl. 109, fig. 8.

Sibine stimulea Clem. Larva, pl. 10, figs. 18 and 19.

Adoneta spinuloides H.-S. Larva, pl. 95, fig. 18.

Parasa chloris H.-S. Larva, pl. 11, fig. 3.

Sisyrosea textula H.-S. Larva, pl. 11, fig. 2.

Phobetron pithecium S. & A. Larva, pl. 14, fig. 4.

Eulimacodes scapha Harr. Larva, pl. 11, figs. 6, 7, and 10; pl. 95, fig. 20.

Apoda biguttata Pack. Larva, pl. 14, fig. 1; pl. 11, fig. 11.

Heterogenea flexuosa Grt. Larva, pl. 95, fig. 19.

Tortricidia fasciola H.-S. Larva, pl. 11, fig. 14.

Unidentified Larvæ.

No. 1, pl. 11, fig. 9. I have taken this larva and think it is *Sisyrosea nasoni* Grt. An account of it will appear in the New York Journal, probably during 1898. [See Journ, N. Y. Ent. Soc., March, 1899, Vol. VII, p. 61.]

No. 2, pl. 11, fig. 1, and pl. 20, fig. 40. The first figure shows an elliptical flattened larva, pale bluish-green, with a subdorsal white line. Lateral horns, eleven in number, pointed, constricted at base, smaller towards the extremities except the pair on joint 13, which are suddenly larger. No subdorsal horns except little stubs on the first two segments, but Glover remarks, in the text, "has peculiar glass-like spines on the back, which unfortunately were broken off." The second figure is pale green without marks,

nine lateral horns, tapering and constricted at base, shortest at the ends without a longer terminal pair. Nine subdorsal horns, represented as spherical. Glover remarks: "Larva has a peculiar transparent, glass-like appearance when living." Both were taken in Maryland, on oak, in September.

What must be the same larva has been described in the notes of the Department of Agriculture, under the number 3242, Limacodes on Oak, Oct. 3, 1883. The description runs as follows: "General color of the body pearly white, with a bluish, rather broad dorsal stripe. Subdorsal space [lateral space] slightly purplish, not so intense as the dorsal stripe. Ventral surface, head, and thoracic joint [joint 2] grass-green; mandibles, labrum and inner base of antennæ brown; ocelli black. Antennæ rather long, yellowish-brown. Spiracles circular, dingy yellow. In the middle of each joint on the dorsal blue stripe is a double broadly V-shaped mark, the point of the V anterior. On the sutures in this same blue stripe are two dusky points, and a single stronger one along the upper margin of the medio-dorsal shade [what is meant by this?] Very strong supra-stigmatal depressions or pits cause a bulging of the sides, and from each prominence arises a sea-green, translucent tubercle, broad and rounded [*i. e.* contracted?] at base, and gradually tapering to point and fringed with long, delicate, glass-like hairs. Discally [*i. e.* subdorsally] there are two very singular compound glassy tubercles with swollen bifid bases, inner bulbous branch and outer long, curved, gradually tapering one, all rather thickly clothed with beautiful glassy, soft hairs, more or less curved at tip. These tubercles are easily detached, and seem to have their root partly in the dusky spot along the upper side of the dorsal region and partly in the V-shaped mark along the medio-dorsal. Those from the prothoracic joint [*i. e.* joint 3 or 4?] and from the anal and penultimate joints [12 and 13] are straighter than those from the sides, and are directed either anteriorly or posteriorly. The tubercles produce a most beautiful vitaline effect. The creature, as it moves, seems to be one mass of delicate floss of finely spun glass, almost as broad as long. The surface of the body, under a high power, is seen to be minutely granulated."

Two dead and dilapidated larvæ were preserved in alcohol. The better of these possesses the subdorsal horns only on joints 3, 12, and 13; the lateral ones are nearly all present, at least on one side, seeming to be on segments 3, 4, 6–12. The arrangement is either as in Phobetron or Calybia, the specimens are too poor to tell which; but the lateral horns are long and functional, though shorter than the subdorsals. They are but little subordinated, thus showing this larva to be a more generalized type than either of the known genera of the "tropic hairy Eucleids." As to the probable imago of this interesting larva, a guess would be haz-

ardous. No second Phobetron-like moth is known north of Florida. One would be inclined to suggest *Monolenca semifascia* if the general characters of this species did not rather imply an affinity with Euclea.

No. 3, pl. 19, fig. 16 A thick, arched larva with broad dorsal and lateral spaces, narrowing to the ends; ridges poorly marked and no horns, but all minutely pilose (?). Segments well marked, incised in the lateral view. Green with a transverse yellow line on the posterior edge of each segment.

Length 18 mm. Taken on the orange in Florida.

I have no suggestion as to what species this may be. Possibly it is not a Eucleid.

Dr. Stiles read abstracts of a paper entitled "Some Practical Points in Dipping Sheep for Scab." The points brought out in this paper will appear in a forthcoming bulletin of the Bureau of Animal Industry, U. S. Department of Agriculture.

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134 April 7, 1898.

Vice-President Gill in the chair. Also present, Messrs. Ashmead, Benton, Busck, Cook, Dyar, Fernow, Heideman, Kenyon, Marlatt, Pratt, and Webber.

The Corresponding Secretary announced that Vol. IV, No. 2, of the Proceedings had been received from the printer March 21 and 22, and had been distributed.

—Under "Short Notes and Exhibition of Specimens," Mr. Pratt showed larvæ and imago of a saw-fly destructive to violets, received from Rhinebeck, N. Y., *Emphytus canadensis*. Mr. Pratt thought he had observed parthenogenesis in this species. Discussed by Messrs. Ashmead and Dyar. Dr. Dyar showed a species of Pleuroneura bred from a free feeding larva on hickory. This is the first larva of the subfamily Xyelinæ to be definitely made known, and the first species of the genus known from America. Discussed by Mr. Ashmead.

—The first paper was by Prof. O. F. Cook, on

THE GEOPHILOIDEA OF THE FLORIDA KEYS.

By O. F. Cook.

In March, 1898, I had the opportunity of spending a few hours in collecting between Key West and Pine Key, most of the available time being spent at Sugar Loaf Key. The season was very dry, and the humus-inhabiting types of all kinds had burrowed out of reach. Of the four species of Geophiloidea secured, however, three are new, and two of these represent new genera without known relatives in the United States. The group is one so generally neglected by collectors that little can be asserted with confidence concerning the distributional limits of its members, but the available information is utilized in the appended synopses of genera.

The Geophiloidea collected on the Keys belong to three families, which may be distinguished as follows:

Antennæ clavate; anal legs very stout, subconic, the joints being mostly broader than long; cephalic and basal lamina very broad, concealing the prehensorial legs from above: Family Ballophilidæ.

Antennæ filiform; anal legs long and usually slender, the joints (except the first) distinctly longer than broad; cephalic and basal lamina not concealing the sides of the prehensorial legs.......... ....

Mandibles with 1–3 dentate lamellæ in addition to the pectinate lamella; labrum entire: Family Schendylidæ.

Mandibles without dentate lamellæ; labrum 3-parted. Family Geophilidæ.

Four other families of Geophiloidea are known from North America, but have not been reported in the Gulf region. These are the Linotæniidæ, of circumpolar distribution; the Himantariidæ,* known from Mexico and California; the Dicellophilidæ,

* To this family (Himantariidæ) but a single American genus, Chomatobius Saussure, is at present referred. Through the kindness of Professor Kraepelin, of the Hamburg Museum, I have had the opportunity of studying a Mexican specimen which agrees closely with Saussure's description, but differs notably from the animal described by Seliwanoff from California as *Chomatobius mexicanus* Saussure. This latter evidently represents a different generic type, for which the new name *Nothobius californicus* is proposed. It is distinct from Chomatobius in having a row of small suprascutella, in having the ventral pores in rounded areas, the last pleuræ with numerous small pores, and the anal legs with a distinct claw, none of which characters appears in the Mexican specimen, nor in Saussure's description of Chomatobius. Seliwanoff's description is contained in the paper entitled "*Geophilidæ Mus. Imp. Akademii nauk*," 1881, p. 24, pl. II, figs. 9–16.

a tropical group with a Californian species, and the Oryidæ, most of which are tropical.

Family Schendylidæ.

The representatives of this family inhabit both continents, but are as yet unknown from the Malay region.

The following synopsis affords diagnosis of the genera, to which a statement of their known distribution is added. With the exception of Pectiniunguis, the habits of which are here recorded for the first time, the members of this family are to be found in the humus of forests or cultivated grounds.

Ventral pores wanting; anal legs provided with a normal claw; pleural pores numerous, pigmented, scattered over the ventral surface of the last pleuræ; last sternum narrow: Genus Escaryus, type *E. phyllophilus*,* New York.

Ventral pores present; claw of anal legs rudimentary or wanting; pleural pores few, unpigmented, opening into two large cavities which are more or less concealed by the broad last sternum........ ....

Anal legs 5-jointed: Genus Nannophilus, type *N. eximius*, Mediterranean Region.

Anal legs 6 jointed..

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* A third species of this genus, *Escaryus sibiricus*, is represented by numerous specimens collected by Graeser at Vladivostock, Siberia, now preserved in the Hamburg Museum. It is distinct from *E. phyllophilus* in the much larger size, the more attenuate antennæ, the wider cephalic lamina, the less prominent nodule of the femur of the prehensors, the very numerous and close-set pleural pores, and the minute claw of the anal legs. The sterna have a very deep median foveola, and are beset with short hairs, but are entirely without pores. The anal legs of males are crassate, strongly curved, and densely hirsute. Larger individuals measure nearly 65 mm. by 2.5 mm.; pairs of legs 49 in males, 49 or 51 in females. I have recently found, in a small collection secured by Professor T. D. A. Cockerell at Dropping Spring, Organ Mountains, New Mexico, still another member of the Schendylidæ which suggests Escaryus in the possession of a normal claw in the last joint of the anal leg. In other characters it approaches Pectiniunguis, from which it differs greatly in habit, being but about 15 millimetres in length, and having in the female 45 pairs of legs. From plate IV, figs. 4*a* and 4*b*, it will be seen that the last sternum is much broader than in Pectiniunguis, and that the proportions of the anal legs of the two forms are very different, in addition to the discrepancy in the matter of the claw. The new genus and species may stand as *Holitys neomexicana*.

Ventral pores arranged in two circular areas: Genus Schendylops, type *S. grandidieri*,* Madagascar.

Ventral pores arranged in a single, median, circular area ....

Claw of maxillary palpus simple; mandibles with a single dentate lamella; last joint of anal legs much smaller than the preceding: Genus Schendyla, type *S. nemorensis*, Europe and North America.

Claw of maxillary palpus pectinate; mandibles with three dentate lamellæ; last joint of anal legs as long or longer than the preceding. ......

Labial and maxillary sterna distinct; labrum free except in the middle; anal legs slender in both sexes: Genus Ctenophilus, type *C. africanus*, Liberia.

Labial and maxilla sterna coalesced in the middle; labrum entirely coalesced; anal legs crassate, especially in the male: Genus Pectiniunguis, type *P. americanus*, Lower California and Florida Keys.

Pectiniunguis Americanus Bollman.

(Plate IV, fig. 3*a*).

This most common myriapod of the Keys was, until the present time, known only from a single male specimen secured by the *Albatross* in the Gulf of California, an indication of its littoral habits. On the Keys it was frequently taken under stranded rubbish of any sort which held moisture and gave sufficient protection. Specimens were more numerous on rocky than on sandy shores, and were sometimes apparently absent from the latter. On Sugar Loaf Key many specimens were secured.

The living animals are a uniform waxy brown in color, or may have two dark longitudinal bands like *Geophilus rubens* Say (*G. cephalicus* Wood). On being disturbed they exhibit all the agility of their order in attempting to escape. No specimens of this species were found in hammocks or cultivated grounds; it is apparently confined to its littoral habitat, and it is easy to understand how it might become widely distributed on floating rubbish or driftwood. Its discovery in the West Indies and along the entire Gulf coast is, accordingly, to be expected.

Regarding the previously unknown female, it should be stated that the anal legs are slender, particularly the two distal joints. The legs are, however, pubescent, with short hairs, as in the male. The genital palpi seem to be rudimentary.

* Grandidier's Histoire, 1897, XXVII, pl. XII, figs. 8–8*g*. This genus is not to be confused with Schendyloides Attems, described as a subgenus of Schendyla, with which it is not related, since the mandibles are without dentate lamellæ, and the labium is tripartite, all three divisions having long teeth. Schendyloides is accordingly a member of the Geophilidæ in the strict sense.

Family Ballophilidæ.

It was the occasion of considerable surprise to collect, on Sugar Loaf Key, a member of this family, as yet known only from Tropical Africa. The West African *Ballophilus clavicornis* (plate V, fig. 3) is an inhabitant of the dense forests of Liberia. It is unique among known Geophiloidea in being nearly black or deep violet in color. It now appears that this peculiarity is shared by other members of the family, undescribed forms from Venezuela and Mexico being in my possession, in addition to the specimens from the Keys. The genus Tæniolinum Pocock, from St. Vincent, is also probably referable to this family. These forms may be separated by means of the following synopsis:

"Antennæ very short and stout . . . their segments wider than long . . . number of pairs of legs 49": Genus Tæniolinum, type *T. setosum*, St. Vincent.

Antennæ slender, more or less distinctly clavate, at least the proximal joints longer than wide; number of pairs of legs above 60.....................

Ventral pores in a transversely elliptical, definite area which is strongly chitinized and distinctly projects beyond the remainder of the surface; coxæ of prehensorial legs without chitinous lines: Genus Ballophilus, type *B. clavicornis*, Liberia.

Ventral pores in subcircular areas which are scarcely prominent; coxæ of prehensorial legs with chitinous lines...... ....

Ventral pores in a single median area; antennæ strongly clavate: Genus Ityphilus, type *I. lilacinus* sp. n., Sugar Loaf Key.

Ventral pores in two areas; antennæ subfiliform: Genus Diplethmus, type *D. mexicanus* sp. n. (plate V, fig. 2), Mexico.

Ityphilus, new genus.

Closely related to Ballophilus, but differing in the much smaller size and more slender habit, in having the ventral pores in a small circular area, which is not definitely chitinized, and in having the coalesced coxæ of the prehensorial legs provided with chitinous sulci.

Ityphilus lilacinus, new species.

(Plate V, figs. 1*a*–1*e*).

Type.—U. S. Nat. Museum, No. 777.

Locality.—Sugar Loaf Key.

Length 30 mm., width .7 mm., pairs of legs of male 71.

Color of living specimens pale brownish pink or lilac; in alcohol the color fades to a pale creamy tint.

The cephalic lamina is broader than long, but is exceeded in width by the very broad basal lamina; frontal lamina not distinct.

Coalesced coxæ of prehensors with chitinous lines, broadly emarginate in front; femur and claw unarmed.

Scuta not sulcate, the surface uneven, hirsute with long hairs; sterna also hirsute and uneven, the poriferous area distinctly prominent, but not so strongly as in Ballophilus.

Last sternum subtriangular, posteriorly truncate; pleuræ scarcely prominent, the two large pores concealed under the sternum; joints of anal legs very short and robust, decreasing in breadth and increasing in length distad; from the last sternum to the ends of the legs extends on each side a row of hairs larger than those which cover the adjacent parts; the last joint is conic and without a claw.

Two specimens were secured in an open area near the shore of the north side of Sugar Loaf Key.

Family Geophilidæ.

Two members of this family were secured on the Keys. One is a new species evidently referable to the genus Polycricus, the type of which is *P. toltecus* Saussure. The second has affinities with the genus Piestophilus Cook, from the West Indies. The mouth-parts of Piestophilus are unknown, but those of the new form are so remarkable that, in addition to the other unique characters, they seem to warrant the recognition of a new subfamily, Piestophilinæ, to be distinguished from the Geophilinæ by the coalescence of all the parts of the labium except the apical joint of the labial palpus.

Polycricus floridanus, new species.

(Plate IV, figs. *2a–2f*).

Type.—U. S. Nat Museum, No. 778.

Locality.—Sugar Loaf Key.

Length 55 mm., width 1.5 mm., pairs of legs of male 59, of female 61–63.

Color of alcoholic specimen rather dark, dull brownish, laterally mottled with purplish, and with rather faint indications of two parallel dorsal bands.

Cephalic lamina two-thirds as broad as long; frontal lamina coalesced; basal lamina rather narrow, the sides strongly converging.

Coalesced coxæ of the prehensors without chitinous lines, the surface moderately punctate; femur with a distinct, blunt tooth somewhat above the middle; claw armed at base with a large, blunt tooth, and denticulate along the middle of its mesial edge.

Scuta bisulcate; sterna with a large and deep median foveola which divides the transverse poriferous band.

Last sternum longer than broad; pleuræ moderately prominent, with numerous pigmental pores; anal legs unarmed, moderately crassate in the male, slender in the female.

Two specimens of this species were found in the undisturbed forest of a hammock on Sugar Loaf Key; three others were collected at Tampa.*

ERITHOPHILUS, new genus.

Body very small.

Frontal lamina coalesced; cephalic lamina not concealing the sides of the prehensors; prebasal lamina concealed and probably wanting; basal lamina broad, the sides converging cephalad.

Labrum similar to that of Geophilus, tripartite, the median division dentate; not sufficiently examined owing to scarcity of material.

Mandibles with a single pectinate lamella; surface of stipe pectinate; condylus not observed.

Labial sternum entire, coalesced with the basal joints of the maxillary palpi and with the interior labial processes; basal joint of maxillary palpus also coalesced with the interior labial process; distal joint of maxillary palpus small, subquadrate, simple.

Maxillary sternum broadly emarginate; maxillary palpus with basal joint broad, subconic; distal joints subequal in length and width, nearly naked; claw small and simple.

Sternum of prehensors with chitinous lines (sulci), scarcely emarginate anteriorly; prosternal teeth obsolete; basal joint of prehensors convex mesad, unarmed; claw unarmed.

Scuta scarcely convex, with two longitudinal sulci.

Spiracles round, decreasing in size caudad; spiraculiferous scutellum much smaller than the very large prescutellum, and about twice as large as the postscutellum; there is a row of three subequal middle scutella and an expisternal postscutellum.

Ventral pores present, but not numerous, occurring in a definite transverse area in the posterior part of the sternum of anterior segments, where the poriferous area is not reticulated; the area and the pores become less distinct and finally obsolete caudad; the episterna are not porose.

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* At Tampa I collected also a single specimen of a new genus apparently related to Schizotænia Cook, based on *S. prognatha*, from Liberia, in that the claw of the anal legs is replaced by a scarcely chitinized, transparent, hirsute, papilliform structure, which might be taken for a small seventh joint. The prehensorial legs also resemble those of Schizotænia, and the coalesced coxæ are provided with chitinous sulci, but the maxillary sternum is entire and without the peculiar processes of Schizotænia. The species may be known as *Tylonyx tampæ;* the female has 47 pairs of legs, the last sternum is broad, and there are two pleural pores on each side.

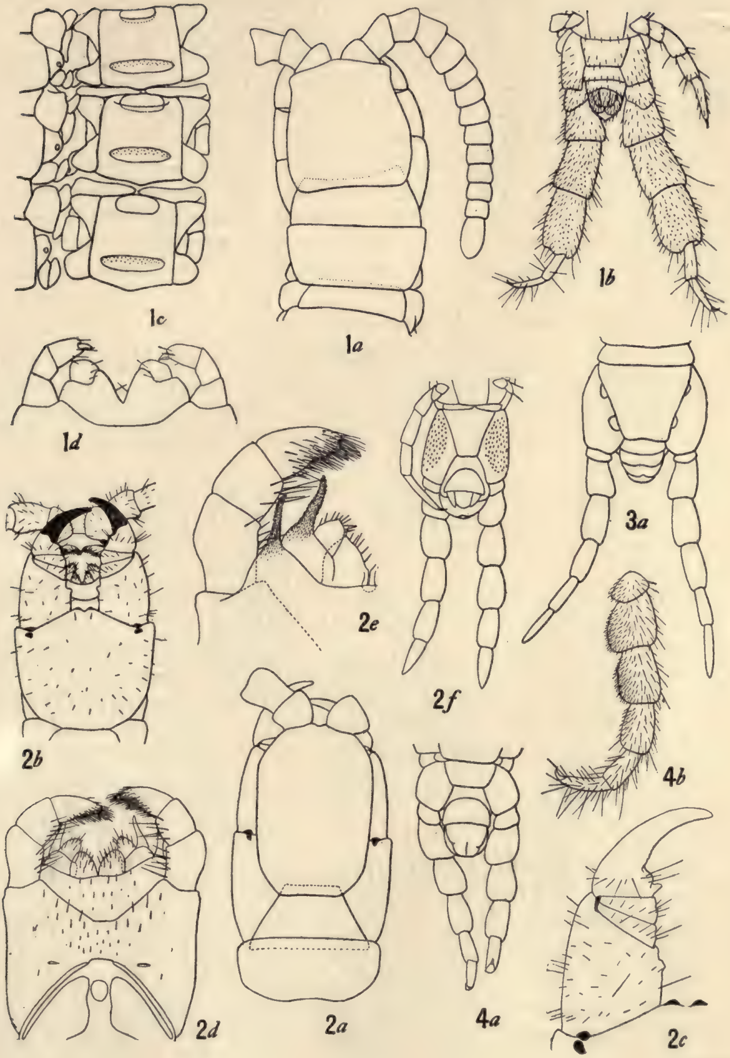

PLATE IV.

Segments 9 to 13 or 9 to 14 have, in addition to the poriferous area, a transversely elliptic depression in the anterior part of the sternum; this is strongly chitinized and clearly defined; the reticulations of the integument are distinct, but are much smaller than elsewhere.

Pleuræ of last segment not inflated; provided with about ten pores opening into two cavities concealed by the last sternum, which is broader than long, with converging sides and transverse posterior margin.

Anal legs 6-jointed and provided with a claw; basal joints very large and crassate, the two distal small and slender, articulated to the superior corner of the fourth joint, against which they close; the ventro-mesial surface of the third and fourth joints have a smooth area perforated by numerous small apertures, possibly the bases of rudimentary hairs, presumably the openings of silk glands; the legs seem to be essentially alike in both sexes.

Genital palpi simple in the male, obsolete in the female.

This genus is undoubtedly closely related, if not identical, with Piestophilus Cook,* based on *Geophilus tenuitarsis* Pocock,† from the West Indian island Dominica. It seems, however, to deserve separation on account of the following points of difference:

Much larger size and greater number of legs, *Piestophilus tenuitarsis* being 35 mm. long and having 85 pairs of legs.

Ventral pores are present in a definite area, while wanting in *tenuitarsis*.

Pleural pores are also present, although the pleuræ are smaller in proportion to the size of the anal legs than in *tenuitarsis*.

The anal legs are apparently much larger in proportion to the last segment, and have a porose area on the mesial face of the third and fourth joints; the strong lateral compression of the four proximal joints described by Pocock for *tenuitarsis* is also not pronounced in the new form.

ERITHOPHILUS NEOPUS, new species.

(Plate IV, figs. 1*a*–1*d*).

Type.—U. S. Nat. Museum, No. 779.

Locality.—Sugar Loaf Key, Florida.

Length 13 mm., width .5 mm.; number of pediferous segments varying from 45 to 47 in males to 51 in females.

Color, waxy white, the extremities brownish.

Four specimens of this species were secured by digging in the ground under stones in a recently cleared place on the north shore of Sugar Loaf Key, Florida, in March, 1898, the same station where Ityphilus was found.

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*Proc. U. S. Nat. Mus.

† Ann. & Mag. Nat. Hist. (6) II, p. 475, pl. XVI, figs. c–c^3 (1888).

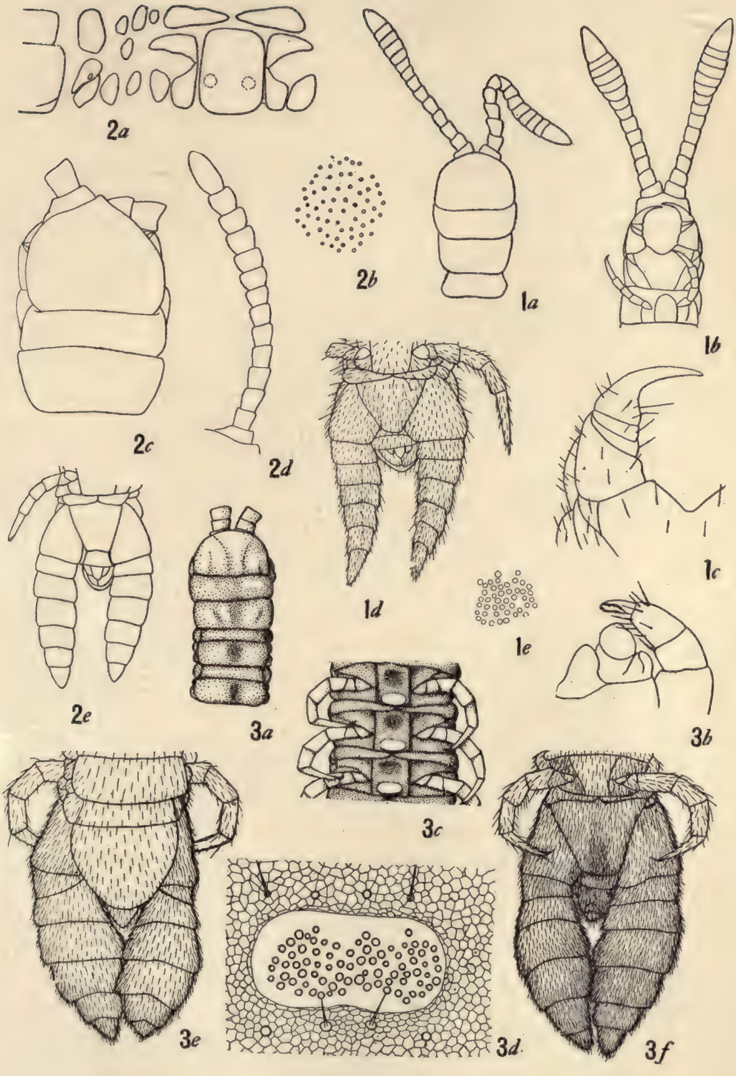

PLATE V.

Explanation of Plates.

Plate IV.

Erithophilus neopus.

Fig. 1*a*. Head, dorsal view.
1*b*. Anal legs, ventral view.
1*c*. Ventral and pleural sclerites of segments 10 to 12.
1*d*. Labium and maxillæ, ventral view.

Polycricus floridanus.

Fig. 2*a*. Head, dorsal view.
2*b*. Same, ventral view.
2*c*. Prehensorial leg more magnified.
2*d*. Labium and maxillæ, ventral view.
2*e*. Same, dorsal view, more magnified.
2*f*. Anal segment, ventral view.

Pectiniunguis americanus.

Fig. 3*a*. Anal segment of female, ventral view.

Holitys neomexicana.

Fig. 4*a*. Anal segment of female, ventral view.
4*b*. Anal leg of female, lateral view.

Plate V.

Ityphilus lilacinus.

Fig. 1*a*. Head, dorsal view.
1*b*. Same, ventral view.
1*c*. Prehensorial leg, ventral view.
1*d*. Anal segment, ventral view.
1*e*. Ventral pores.

Diplethmus mexicanus.

Fig. 2*a*. Ventral and pleural sclerites, the dotted circles showing the location of the ventral pores.
2*b*. A cluster of ventral pores.
2*c*. Head, dorsal view.
2*d*. Antenna.
2*e*. Anal segment, ventral view.

Ballophilus clavicornis.

Fig. 3*a*. Head and first three segments, dorsal view.
3*b*. Maxilla and half of labium, dorsal view.
3*c*. Three segments, ventral view, showing the prominent, transversely elliptical pore-areas.
3*d*. One of the pore-areas more magnified.
3*e*. Anal segment, dorsal view.
3*f*. Same, ventral view.

—The second paper was by Mr. C. L. Marlatt, "Remarks on the Periodical Cicada, with a Review of the Literature."* Discussed by Messrs. Ashmead, Kenyon, Cook, and Gill.

135

MAY 5, 1898.

Vice-President Dyar in the chair. There were present, also, Messrs. Ashmead, Heidemann, Pratt, Banks, Busck, Marlatt, and Dr. Yngve Sjöstedt, Assistant to the Royal Entomological Institute, Albano, Stockholm, Sweden.

—Under "Notes and Exhibition of Specimens," Mr. Pratt exhibited a large series of specimens representing the different stages of a pyralid moth (*Clydonopteron tecomæ* Riley) which he had reared from the seed pods of the trumpet vine (*Tecoma radicans*), its food plant. He stated that it was a rather rare insect. Discussion followed on the species by Messrs. Ashmead and Dyar.

—Mr. Dyar exhibited the full-grown larvæ of the *Xyela minor*, which he stated developed inside of the flowers of the pine, reaching full growth before the flowers fall. At this date most of the larvæ had already escaped from the flowers to enter the soil. Larvæ of this common saw-fly have never before been discovered. In discussion, Mr. Ashmead commented on the larval characteristics, which he said supported and justified his classification in which he had given the Xyelidæ as a distinct family. The fact of the abundance of the adults of these species about pine trees in early spring was commented on by various persons, and the fact that it had often been referred to was also recalled. In further discussion of the structure of these larvæ, Mr. Dyar pointed out that in the two free feeding genera of this Xyelniæ rudimentary abdominal feet are found, whereas in the other genus the abdominal feet are wanting.

—Mr. Banks exhibited a new species of *Prosalpia*, for which he proposes the name *pacifica*. The species was collected in California, and represented a genus new to this continent. The peculiar characteristics of the genus and its affinities were pointed

* Published in Bulletin 14 (new series), Division of Entomology, U. S. Department of Agriculture, 1898.

out. A discussion followed, introduced by this note on the resemblance between the Pacific fauna and that of Europe, and various explanations for the similarity shown were suggested.

—The first paper was by Mr. Ashmead, and was entitled "Some Remarks on the Characteristics that Distinguish the Families of Ants." The author stated that he had separated the ants into seven distinct families, five of which had been previously recognized as subfamilies, and two were new divisions. It was stated that the characters of the males, especially the genitalia, were particularly satisfactory, enabling the prompt reference of specimens, but that in the females and workers the characters were less satisfactory. The paper was illustrated with sketches showing structure, and examples of the seven families were exhibited.* The paper was discussed by Messrs. Banks and Pratt. The latter called attention to the use of Cephalotes in Brazil as food.

—The second paper was by Mr. Banks, and was entitled:

A NEW SOLPUGID FROM CALIFORNIA.

By Nathan Banks.

Several years ago Dr. A. Davidson, of Los Angeles, California, sent me a small collection of spiders, and among them a pretty little Solpugid. While studying some Mexican species recently I took occasion to examine this form, and, on its proving to be new, drew up the following description:

Cleobis californica, n. sp.

Length 9 mm., head 1.7 mm. long, broad 2 mm., mandibles [plus finger] 2.5 mm. long. Head yellowish, blackish on posterior sides, eyes on a black spot; mandibles yellowish, the fingers reddish; palpi pale, a broad dark band on the middle of the metatarsus; legs pale, all but the first pair infuscated above on the femora, tibiæ, and metatarsi; abdomen rather purplish, paler at base, a median darker stripe not distinct. Front border of head curved, but not as much as in some other species; the eyes small, nearly twice their diameter apart; median groove not very distinct; mandibles long, the fingers long and slender, the upper one has three teeth of nearly equal size, between the outer two is a smaller one, and basad of the inner one there are several on the fond of the jaw; the lower finger has a large tooth near base, then a much smaller one at its foot, and beyond is a medium-sized tooth; beyond this last there are seven denticles, giving the finger a serrate appearance when seen from the side;

* The paper will be published elsewhere.

the mandibles are clothed with stiff, reddish bristles; the legs and palpi are of the usual shape, and clothed with moderately short hairs and some spines; the triangular piece at base of venter has a depressed area on its posterior part, broadest behind, and its margin each side terminated by a deep indentation.

One specimen, Los Angeles, California [Davidson]. It is easily distinguished by the serrate appearance of the lower finger [which does not occur in any other species], and by the coloring of the palpi.

Discussion followed by Messrs. Ashmead, Banks, and Marlatt relating more particularly to structural characteristics commented on by the author of the paper, and particularly the value of the mandibular teeth of insects in classification, Mr. Ashmead speaking of the use of this characteristic in the classification of ants by old authorities; and the modification or wear of the teeth in old specimens was also noted and the important modification which wear sometimes effects in the case of cicada larvæ two or three years after moulting was described by Mr. Marlatt.

—The third paper was by Mr. Dyar, and was entitled:

DESCRIPTIONS OF THE LARVÆ OF FIFTY NORTH AMERICAN NOCTUIDÆ.

By Harrison G. Dyar.

The Noctuid larvæ here described are from the collection of the U. S. National Museum, and are those of which descriptions have not been previously published to my knowledge.

Unless otherwise stated, the head is rounded, almost as high as wide, moderately bilobed, the clypeus reaching about half way to the vertex; slightly retracted below joint 2. Cervical shield indistinct, not cornified. Body cylindrical, abdominal feet equally developed on joints 7 to 10 and 13; joint 12 not, or but slightly, enlarged. Tubercles normal, single, iv behind the spiracle, about equally distant from iii and v or nearer to iii than to v. The longitudinal lines are the dorsal, situated centrally on the back, unpaired; the subdorsal, half way between the dorsal and the spiracles, paired; the lateral, half way between the subdorsal and the spiracles, not touching the latter; the suprastigmatal or stigmatal, just touching the tops of the spiracles or partly enclosing them and occupying all the space between the lateral and substigmatal lines; the substigmatal running below the spiracles and enclosing their lower portion. The ordinary lines are the

dorsal, subdorsal, and substigmatal. The subdorsal oblique shades extend from the subdorsal line on the anterior margin of each segment to the dorsal line on the posterior margin. Lines not mentioned in the descriptions are absent. "Bordered," without qualification, means edged on both sides. The measurement of the head given is its approximate width. All descriptions are believed to be from full-grown larvæ.

1. **Rhynchagrotis rufipectus** Morrison.

Head 1.5 mm., pale, heavily mottled with dark brown, which forms a continuous band closely bordering the median suture and clypeus from vertex to mouth. Joint 12 rather distinctly enlarged. Body heavily mottled with light and dark brown dottings, mixed with greenish laterally, forming obscure dark subdorsal oblique streaks and a distinct blotch on joint 13 anteriorly. All the ordinary lines lost except the dorsal, which is narrow, straight, sordid white, distinct, broken only in the incisures, sometimes edged with blackish there. Thoracic feet pale, leg shields dusky; tubercles and setæ minute, in pale rings. Spiracles dark.

Food plant, grass. Dept. of Agriculture, No. 3503.

2. **Rhynchagrotis alternata** Grote.

Head 3 mm., pale, reticulated with brown, the curved band from vertex nearly contiguous to median suture, faint below, concentric with a narrower line that runs upward from the eye. Body heavily mottled with dark brown, subventral region and feet much paler. Dorsal line whitish, very narrow, broken somewhat broadly in the incisures; oblique subdorsal shades dark, diffuse, paler edged posteriorly; subdorsal line obsolete, just indicated by a paler shading; substigmatal band sharp above, defined by a white line which undulates, passing below the spiracles, mottled below with reddish-brown and shading off into the pale subventral area. Tubercles and setæ minute except on the feet. Spiracles black rimmed.

Food plants, oak, hickory, etc. Dept. of Agriculture, No. 3355.

3. **Rhynchagrotis crenulata** Smith.

Head 3.3 mm., pale, reticulated with brown, the curved band from the vertex distinct below and a brown patch in the clypeus; line upward from eye not more distinct than the other reticulations. Body brown, the ground color pale brown, finely striate-mottled with dark brown; dorsal line pale, narrow, nearly broken down in the centers of the segments, edged with black-brown in the incisures; subdorsal line more distinct, pale, on joints 3 to 12, narrow; oblique shades pale, but alternating before with somewhat wedge-shaped black patches that rest on the subdorsal line; sides finely mottled, obscurely streaked, the substigmatal line broad, but very faint, only a shade paler than the body, sharp-edged above and below. Feet concolorous, brown. Tubercles minute. Spiracles black rimmed.

Food plants, "various plants." Alameda Co., Cal. A. Koebele, No. 171.

4. **Eueretagrotis sigmoides** Guenée.

Head 2.5 mm., rather dark brown, obscuring the markings, which are as in *R. alternata.* Body pale brown, somewhat pinkish or cream-color; dorsal line narrow, pale, brown marked, and shortly broken in the incisures; subdorsal shades and lines scarcely perceptible; substigmatal line straight above, narrowly pale, edged with a dark line that runs through the centers of the spiracles (except on joint 12), broad, illy defined below, and shading off into the pale subventral area.

Food plant not stated. Dept. Agriculture, No. 3185. Close to *R. alternata*, but the stigmatal line is more rigid and the subdorsal shades obscure.

5. **Noctua bicarnea** Guenée.

Head 3.5 mm., pale, distinctly reticulated, the vertical curved band very heavy and nearly black, distinct below, but without spot in clypeus; line from eye distinct on lower half of face. Body a little flattened, light brown, streaked and mottled with darker brown; dorsal and subdorsal lines pale, narrow, about alike, the former broadly bordered with a dark brown area, which is retracted at the incisures, the latter narrowly brown bordered, thus leaving a pale space between that widens at the incisures; a broad, regular, dark brown, mottled suprastigmatal band, just enclosing the spiracles, edged below by the whitish, narrow, slightly waved, upper line of the substigmatal band. This is pale, illy defined, reddish, sharply edged, but nearly indistinguishable from the light brownish subventral area. Feet pale; tubercles minute. Spiracles brown, black rimmed.

Food plant not stated. Washington, D. C., Dept. Agriculture.

6. **Feltia vancouverensis** Grote.

Head 3.6 mm., pale, reticulate, the curved vertical dark band faint below; ocellar line not strongly marked. Much as in *R. alternata.* Brown and cream-color, mottled on a greenish ground that appears subventrally; cervical shield gray, not well cornified. Lines all obsolete except the narrow, pale, dorsal one, which is moderately distinct on the anterior portion of the body only. The brown mottlings are heavier dorsally (contracted at the incisures), and above the normal position of the subdorsal line, enclosing a pale space that widens in the incisures. Tubercles in distinct, brown, corneous areas; setæ minute; spiracles black.

Food plant, wild cherry. Placer Co., Cal. A. Koebele, No. 236.

7. **Carneades wilsonii** Grote.

Head 3.6 mm., pale brown, reticulations very obsure, paler than the ground color which is thus divided into polygonal areas; vertical band obsolete above and below, existing as a dash beside the clypeus. Body green, lined with white. Dorsal, subdorsal, and lateral lines rather narrow, straight, but transversely cut into blotches; substigmatal line broad, obscurely double, being narrowly centered with green. Feet pale; spiracles black. Tubercles in distinct cornified areas; setæ minute.

Food plants, "two species of plants on the sea-coast." San Francisco, Cal. A. Koebele, No. 257.

8. **Carneades brunneigera** Grote.

Head 2.7 mm., roughly shagreened, dark brown, a pale space above the eyes on the side of each lobe; no reticulations. Body dull, sordid brown, the skin somewhat translucent. Cervical shield brown; markings obsolete; the pale dorsal line can be made out the whole length edged with a dark shade that is contracted at incisures; also a dark shade at position of subdorsal line, leaving a pale space widening at incisures as in *F. vancouverensis*. Spiracles black; tubercles in cornified areas; setæ minute.

Food plant not stated. Placer Co., Cal. A. Koebele, No. 141. Very similar to *F. vancouverensis*, but paler, more translucent, and the head roughened.

9. **Carneades perexcellens** Grote.

Head 3 mm, reddish-brown, shining; faintly marked by pale reticulations Cervical shield shining brown, slightly cornified. Body sordid brown, somewhat translucent as in *C. brunneigera*, and similarly marked. Dorsal space broadly pale, nearly obscuring the pale dorsal line, this pale area only slightly widening at the incisures, and reaching almost to the faintly traceable, narrow, pale subdorsal line. Substigmatal line faintly shadowed, whitish, concolorous with the pale subventral area. Spiracles black; tubercles cornified; setæ minute.

Food plant not stated. Alameda, Cal. A. Koebele, No. 582. Closely similar to *C. brunneigera*, but the head is not roughened.

10. **Carneades divergens** Walker.

Head 2.9 mm., shining brown, the dark curved vertical shade distinct above and near the median suture; reticulations pale, obscure, dividing the sides into rounded dark spots. Cervical shield brown, darker before and behind, bisected by pale. Body sordid grayish, translucent, scarcely marked. Dorsal area broadly pale and nearly straight as in *perexcellens*. Subventral region light. Nothing else appears, at least in the inflated specimen. Spiracles black; tubercles cornified; setæ minute.

Food plant not stated. Placer Co., Cal. A. Koebele, No. 267. Similar to *C. brunneigera* and *perexcellens*, but more translucent than these, the tubercles distinctly contrasted.

11. **Mamestra meditata** Grote.

Head 2.5 mm., shining dark brown, reticulate with a still darker tint, the curved vertical band black, distinct above and below; ocellar line narrow; a dark spot in clypeus. Cervical shield blackish, shining, divided by dorsal and subdorsal pale lines. Body reddish-brown, finely marbled, somewhat paler below the spiracles. Two broad blackish shaded bands, the dorsal composed of segmentary diamond-shaped marks, faintly divided by the obscure dorsal line (as in Carneades, but less rounded); the lateral filling in the space between the subdorsal and substigmatal lines, or re-

duced to a series of oblique dashes above tubercle iii. These lines are pale, faintly traceable, the upper border of the substigmatal pale, bent down at the spiracles, the band itself obscure, defined, but scarcely paler than the subventral area, and not contrasting. Spiracles and feet blackish; tubercles in blackish areas; setæ minute.

"Found under wood." Dept. Agriculture, No. 2571.

12. **Mamestra detracta** Walker.

Head 3 mm., brown, shining, the bands and reticulations darker brown; vertical band faint below, ocellar band narrow. Cervical shield shining dark brown, divided by yellowish dorsal and subdorsal lines; anal plate brownish with central pale line. Body pale yellowish, finely marbled with red-brown; dorsal line nearly obsolete except anteriorly; subdorsal line more distinct, yellowish; below it the marblings are more dense. Feet pale, spiracles black ringed; tubercles and setæ minute.

"Found on leaf buds and at foot of hickory tree." Dept. of Agriculture, No. 3358.

13. **Mamestra rubefacta** Morrison.

Head 3 mm., shining brown, marked as in *M. detracta*. Cervical shield shining brown, divided by a central line and marked with pale on the lateral margins; anal plate brownish with central pale line. Body densely marbled with brown; dorsal line straight, narrow, distinct, slightly yellowish, more or less distinctly bordered by a diffuse dark shade. Substigmatal line broad, enclosing the spiracles, paler than the body but only slightly contrasted, the mottlings above it darker. Spiracles black ringed; tubercles brown, cornified; setæ distinct, pale. Feet pale.

Food plant not stated. Dept. of Agriculture, No. 2500.

14. **Mamestra quadrilineata** Grote.

Head 2 mm., brown, the reticulations darker, but broken; vertical band irregular, narrowed, a large patch behind vertex; surface dull, not shining. Body dark sordid brown, marks all obscured; a series of lateral darker patches below the pale, narrow, obscure, subdorsal line. The skin is densely roughened, granular, the tubercles somewhat enlarged, tubercle ii of joints 12 and 13 produced into distinct prominences with conical secondary spines. Setæ coarse, moderately long. Feet brown, concolorous with the body. Cervical shield and anal plate like the rest of the body, roughened.

Food plant not stated. Los Angeles Co., Cal. A. Koebele, No. 119.

15. **Mamestra quadrata** Smith.

Head about as high as wide, slightly bilobed, the area around clypeus and vertical dark bands somewhat translucent and poorly pigmented; reticulation brown, distinct on a pale ground; width 2.5 mm. Body sordid pale brownish, the lines mostly obscured by the fine, diffuse, dark brown reticulations. Dorsal line discernible, pale, most evident on the posterior parts of the segments, cutting the cervical shield. Oblique blackish sub-

dorsal shades, most distinct posteriorly, being somewhat curved on joints 11 and 12. Subdorsal line obsolete, a trace distinguishable, pale. Substigmatal line pale, rather broad, but nearly entirely obscured, touching the small spiracles which are white, black rimmed. Shields not cornified. Tubercles minute, setæ rather distinct, pale. Skin dorsally finely spinulose-pilose.

Placer Co., Cal. A. Koebele, No. 31. The moth is labelled 31 ?; other specimens bear the number 247.

16. **Hadena apamiformis** Guenée.

Head 3.2 mm., dark reddish-brown, shining, the reticulations and bands only a shade darker and not contrasted. Body rather pale brown; cervical shield large, semicircular, brown with pale central line and fainter subdorsal one; anal plate brown with central line. Dorsal line distinct, pale, joining the pale ground in the incisures and a little blotchy, bordered with a dark brown shade that is contracted at the incisures. Subdorsal line almost as distinct as the dorsal, separated from the pale area above by dashes of brown mottlings; lateral area filled in with dark mottlings. Substigmatal line broad, sharp edged above, completely enclosing the spiracles, continuous with the pale subventral area. Legs corneous brown; spiracles black ringed; tubercles in corneous areas; setæ minute.

Food plant not stated. Dept. of Agriculture, No. 2491.

17. **Hadena cuculliformis** Grote.

Head 3.2 mm., shining reddish-brown, the markings almost entirely obsolete. Cervical shield brown, blackish edged, a distinct central pale line and traces of a subdorsal line. Dorsal region heavily blackish strigose mottled; dorsal and subdorsal lines broad, pale, dotted and mottled with blackish. Stigmatal line broad, touching tubercle iii, centered by the spiracles, sharp edged, pale, but scarcely contrasted from the pale subventral region. Feet pale, the leg shields corneous brown. Spiracles black ringed; tubercles corneous; setæ rather distinct, pale.

Food plant *Elymus condensatus*. Santa Cruz Mts., Cal. A. Koebele, No. 637.

18. **Hadena relecina** Morrison.

Head 3.5 mm., large, scarcely at all retracted below joint 2, greenish, shaded with corneous brown, the mouth-parts darker. Body dull greenish, mottled with purplish without any markings, at least in the inflated specimen. Spiracles black, feet pale, tubercles and setæ minute.

"Food plants various." Placer Co., Cal. A. Koebele, No. 30.

19. **Hadena genetrix** Grote.

Head green without distinct marks; mouth brownish, ocelli black; width 1.5 mm. Body green with the lines white, conspicuous, widened almost into diamond shape in the middle of each segment. Dorsal line rather broad, white, narrowed in the incisures and greenish tinted on the segments, reaching the ends. Subdorsal line white, nearly broken in the

incisures and sharply, angularly widened in the center of each segment, edged above with brown, this color produced obliquely forward a little from the apices of the widened portions. The line reaches the anterior end, but is not distinct on joint 13. Substigmatal line white, strongly narrowed in the incisures, widest behind the spiracles, shaded with green in the centers of the segments; edged narrowly above and below with dark brown, the lower border widened into diffuse patches posteriorly on the segments. The line reaches the anterior end and the anal foot. Feet normal, spiracles small, white, black ringed. Tubercles minute; setæ moderate, pale.

Food plant, *Adenostoma fasciculariun*. Alameda Co., Cal. A. Koeble, No. 409.

20. **Hadena adnixa** Grote.

Head 2.8 mm., pale brown, mouth concolorous, ocelli black. Body green, finely dotted and streaked with white. Dorsal line white, narrow. straight, distinct, a little widened in the incisures, not broken; subdorsal line narrower, dotted, white; substigmatal line narrow, equal to twice the height of the spiracle, which it partly encloses, the upper half dark red, the lower half yellow. Spiracles narrowly black rimmed; feet whitish; tubercles and setæ minute; cervical shield entirely uncornified; imperceptible.

Food plant, wild cherry. Placer Co., Cal. A. Koebele, No. 223.

21. **Oligia grata** Hübner.

Head 2 mm., shining brown-black, the curved vertical band, clypeus, and a patch above the eyes paler. Thorax (joints 3 and 4) and joint 12 distinctly swollen, the larva robust with small head. Dark brown to greenish gray, mottled, finely peppered with pale; dorsal line whitish, narrow, absent on thorax and joint 13, diffusely widened in the centers of the segments 6–12 or straight and red tinted. Subdorsal band broad, pale, obscured in dark specimens. Substigmatal area uniformly lighter, the white dottings more numerous, its upper edge sharp, waved, passing below the spiracles, grading below into the subventral area, not contrasted. A row of faint orange subventral shades. A blackish patch below tubercle i on joint 6. Thoracic feet black marked; abdominal ones spotted. Spiracles black; tubercles and setæ minute.

Food plant not stated. Washington, D. C. Dept. Agriculture, No. 2485.

22. **Macronoctua onusta** Grote.

Head roughened with creases, clypeus bulging, depressed on either side; dark mahogany brown, shading to black around the mouth, shining; width 4.5 mm. Body smooth, translucent sordid white, thin-skinned; dorsally shaded with dull red. Spiracles black; no markings. Cervical shield large, cornified, light brown, obscurely bisected, uniform; prespiracular tubercle also well cornified. Anal plate large, rather weakly cornified, but with large, sparse, black punctures. Leg shields very weak,

the feet rather slender, but equal. Thoracic feet small, brown. Tubercle iii*a* small, but rather distinct, situated before the upper corner of the spiracle. Tubercles and setæ minute, dark.

Bores in the roots of German lily. Charles City, Iowa. Dept. of Agriculture, No. 8145.

23. **Dargida procincta** Grote.

Head 3.5 mm., large, pale, the curved band, clypeus and reticulations light brown, dividing the lobes into a series of whitish spots, each composed of little confluent dots. Body olive brown, longitudinally strigose, dotted with pale. Dorsal line broad, pinkish, filled with brown strigæ, producing the effect of a rich pulverulent brown; subdorsal line broader (1 mm.), pale yellow, slightly olive dotted, edged above with dark velvety shades at anterior borders of segments, and also, more faintly, below. Lateral band broad, like the subdorsal, but a little narrower and fainter, not edged; substigmatal band as broad as the subdorsal, including the lower edges of the spiracles, whitish, but filled in with dull red, except its sharp upper and lower edges. Subventral region and feet paler. Spiracles white with a dark velvety shade above, narrowly black ringed. Cervical shield and anal plate slightly yellowish, marked by the subdorsal line, the shield also by a pale dorsal streak. Tubercles and setæ minute.

Food plant not stated. Placer Co., Cal. A. Koebele, No. 142.

24. **Caradrina miranda** Grote.

Head 1.8 mm., light brown, the curved vertical band distinct throughout and with the reticulations dark brown, but the latter are faint above. Body pale brown, mottled with gray, faintly marked, but almost exactly as in *Mamestra meditata*. Dorsal line obsolete except anteriorly, the gray shade bordering it constricted at the incisures; subdorsal line obsolete, the space between it and the stigmatal line shaded with gray; substigmatal band pale, indistinct, sharp edged above, straight and partly enclosing the spiracles, illy defined below except slightly by faint subventral orange patches. Spiracles black, tubercles and setæ minute; shield and anal plate scarcely perceptible.

Food plant not stated. Alameda Co., Cal. A. Koebele, No. 358.

25. **Caradrina extimia** Walker.

Head 2 mm., dark reddish-brown, faintly dotted above with darker brown. Body somewhat translucent, pale, mottled with gray with a reddish tint. Dorsal region broadly pale, containing very faintly the gray diamond-shaped marks; dorsal line obsolete except anteriorly, pale. Space between subdorsal line and spiracles dark. Other lines obsolete, the subventral region gradually paler below. Spiracles black; tubercles minute, but cornified, in pale areas; setæ rather large. Feet pale; cervical shield and anal plate slightly cornified.

"Found under boards." Santa Clara Co., Cal. A. Koebele, No. 169.

26. **Orthodes vecors** Guenée.

Head 2.3 mm., brown, the vertical band and reticulations paler, leaving dark spottings on the lobes. Body pale, mottled with brown gray, marked as in *Caradrina miranda*. The dorsal dark shade forms rather distinct diamond-shaped marks, cut by the narrow, pulverulent, pale dorsal line. Lateral area heavily brown mottled, dark, darkest just above the spiracles. Substigmatal line broad, defined, reddish, partly enclosing the spiracles, distinguished from the subventral area. Thoracic feet pale, leg plates dusky. Shields slightly cornified, cut by the dorsal line. Spiracles black, tubercles and setæ minute. Joint 12 rather distinctly enlarged, with a pale transverse line, connecting the subdorsal lines; joints 11 and 12 shaded distinctly with brown on the sides.

Food plant not stated. Dept. of Agriculture, No. 3501.

27. **Tæniocampa rufula** Grote.

Head 2.5 mm., light brown, vertical curved band and reticulations dark brown, distinct throughout. Body pale brown, somewhat reddish dorsally; cervical shield distinct, brown before, pink behind; anal plate pale except at the sides. Dorsal line pale, pulverulent, broken into a series of dashes centering the diffuse, dark, diamond-shaped, segmentary patches. Subdorsal line undulate, pale, not defined from the pale area bordering the dorsal patches. Sides darkly mottled, all the lines obsolete, the color becoming paler below, but marked with a double row of subventral brown patches (on tubercle v and before vi). Feet brown; spiracles black; tubercles in cornified areas, setæ black, rather distinct. On joint 12 the subdorsal line widens almost to the spiracle.

"Food plants various." Alameda Co., Cal. A. Koebele, No. 46.

28. **Tæniocampa pacifica** Harvey.

Head 3.3 mm., green, the vertical band and reticulations faintly brown. Body green, the segments rather distinctly 4-annulate, speckled with white. Dorsal line white, distinct, narrow; subdorsal line narrower, pulverulent, broken, the dottings tending to form a line between these; stigmatal band narrow, white, running just above the spiracles except on joints 2 and 12, slightly tinted with olive above on the thorax. Feet pale; spiracles white, narrowly black rimmed; tubercles and setæ minute.

Food plant *Æsculus californica*. Alameda Co., Cal. A. Koebele, No. 334. Exactly like the eastern *T. alia*.

29. **Orthosea purpurea** Grote.

Head 3.8 mm., pale, the vertical band and reticulations dark brown, distinct throughout. Cervical shield dull black, cut faintly by dorsal, distinctly by pale subdorsal lines. Body greenish, streaked and mottled with reddish-brown; dorsal line pale, very narrow and broken down between the segments; oblique shades olivaceous, distinct on joints 5 to 12, the pale subdorsal line broken into a series of dashes that partly border the shades behind. Substigmatal band broad, yellowish, partly enclosing the

spiracles, straight, defined above and below. Subventral area reddish; feet pale; spiracles black ringed; tubercles and setæ minute. On joint 12 the oblique shades join a medio-dorsal shade, forming a trifid mark that is rounded behind.

Food plant not stated. Alameda Co., Cal. A. Koebele, No. 583. Before the last stage the larva is green and differs considerably in appearance.

30. **Orthosia bicolorago** Guenée.

Head 2 mm., shining brown, vertical band and reticulations darker brown, distinct throughout. Body greenish, heavily mottled with red-brown; cervical shield brown, mottled, faintly divided by dorsal and distinctly by subdorsal lines. Dorsal line pale, narrow, pulverulent; oblique shades brown, each filled in before to the dorsal line, producing a series of dark segmentary triangles, the base in front and a little produced along the dorsal line. Subdorsal line pale, narrow, pulverulent, throwing off faint branches that partly border the oblique shades behind. Substigmatal line indicated by pale mottlings, obsolete. Spiracles black, in dark areas; feet pale, leg plates dusky; tubercles and setæ minute, in pale areas.

Food plant, maple. Dept. Agriculture, No. 3369.

31. **Glæa olivata** Harvey.

Head 3.6 mm., pale brown, the vertical band and reticulations distinct, but not very dark; reticulations fine. Body olivaceous, mottled with brown, and dotted with pale; shield more uniformly brown, cut by the lines. Dorsal line narrow, pale, straight; subdorsal pale, but nearly lost in the dots and mottlings. Substigmatal band broad, sharp edged, just touching the spiracles, but well below those on joints 2 and 12, yellowish, broadly centered with red-brown mottlings, edged above by a narrow dark brown line that partly encloses the spiracles. Feet pale; spiracles black ringed; tubercles and setæ minute.

Food plants oak and wild cherry. Dept. Agriculture, No. 3357.

32. **Glæa inulta** Grote.

Head 3.8 mm., pale brown, the usual markings nearly obsolete, but the tubercles, mouth, and sutures of clypeus dark brown, these sutures trisecting a faint orange-yellow band that extends across between setæ viii of the two lobes. (Seta viii is just above ix, both being above the base of antenna.) Body translucent, sordid whitish, immaculate, the tubercles, shield, and anal plate cornified, brownish. Spiracles black; legs with dark claspers; tubercles and setæ small.

Food plant *Viburnum nudum*. Dept. Agriculture, No. 3368. The head of this larva is marked curiously like that of *Charadra deridens*. Judging from this unusual marking and the thin skin, one would say that this was a concealed feeder, living in a spun-up leaf.

33. **Jodia rufago** Hübner.

Head 3 mm., light brown, the vertical band and reticulations darker brown, distinct; clypeus pale. Body light brown, finely mottled on a pale

ground; cervical shield contrasting, velvety black, divided only by the yellowish subdorsal line; anal plate pale. Dorsal and subdorsal lines narrow, pale, breaking down; tubercles in brown rings. Stigmatal band pale yellow, narrow, nearly enclosing the spiracles except on joints 2 and 12 where it passes below them, not wider than the height of a spiracle. Feet pale, except the tips of the thoracic ones; spiracles black rimmed; tubercles and setæ minute.

Food plant, oak. Dept. Agriculture, No. 3350. Before the last stage the cervical shield is not black.

34. **Xylina carbonaria** Harvey.

Head wider than high. scarcely bilobed, shining, pale brown marked with very dark brown; an even vertical band from the back of the head to the clypeus near apex; distinct reticulations all over the surface, the paraclypeal pieces and cheeks below ocelli also dark; clypeus centrally pale and somewhat translucent; width 2.8 mm. Body pale brown, heavily marbled-reticulate with red-brown. Dorsal line straight, narrow, pale, not cutting the anal plate and only faintly so the cervical shield. Substigmatal line rather narrow, pale, but overlaid by the red reticulations. Spiracles narrowly black edged. Leg plates uncornified, shields somewhat corneous, distinct, brown, not shining. Feet equal, tubercles and setæ minute, dark.

Food plant, willow (*Salix californica*). Los Angeles Co., California. A. Koebele, No. 144.

35. **Xylomiges ochracea** Riley.

Head rather small, wider than high, green, clypeus whitish; a diffuse brown vertical band to base of clypeus and two short side lines, the reticulations faint except toward the back of the head; labrum pale; width 2.5 mm. Body reddish-brown, dotted, mottled, the pale ground obscured except narrowly at the incisures. Dorsal line distinct, widening in the center of each segment, yellowish white, suffused with pink, reaching the extremities. Subdorsal line broad, sharp, yellowish white, narrowly vinous red in the incisures, edged above diffusely with velvety brown; lateral line present, narrow, yellowish white, the edges somewhat crenulate and breaking down, irregularly edged with velvety brown below. Both this line and the subdorsal reach the extremities. Substigmatal line broad, distinct, sharp edged, narrowed in the incisures, touching the lower edges of all the spiracles, reaching from joint 2 anteriorly to the end of the anal foot, yellowish-white, centered with diffuse vinous mottlings. Spiracles narrowly dark rimmed. Shields scarcely cornified, cut by all the lines; tubercles and setæ minute.

Food plant, *Artemisia californica*. Los Angeles Co., Cal. A. Koebele, No. 115.

36. **Xylomiges patalis** Grote.

Head 2.7 mm., pale around mouth and base of antennæ, heavily shaded with dark brown above, the vertical band distinct below. Body dark

brown, mottled with black crinkled lines and streaks, the ordinary lines obsolete. Dorsally there is a brown shading that fills in the triangular area marked out by the oblique shades when they are present; behind these areas the black linings prevail. On the sides the black lines produce diffuse patches laterally, and at the spiracles, on joint 12 forming a dorsal dash. Spiracles black; feet pale, leg plates dusky. Tubercles small, cornified, vi rather large; setæ minute. Substigmatal band very faintly outlined, broad, pale.

Food plant not stated. Alameda Co., Cal. A. Koebele, No. 248.

37. **Plusiodonta compressipalpis** Guenée.

Head 2.3 mm., not retracted below joint 2, pale brown with a darker brown spot behind the eyes which is circled by a similarly colored band that starts behind vertex, borders clypeus and covers ocelli; clypeus brown. Body purplish brown, the ordinary lines reduced to obscure pale mottlings; a large white blotch on joint 5 covering the back to the spiracles, narrowed dorsally; another blotch on joints 7 to 9, oblique, starting in a point dorsally on joint 7, covering most of 8 except ventrally anteriorly, and ending at the foot on joint 9. Dorsal area of joints 9 to 11 slightly tessellated with white to a pinkish white subdorsal patch on 11 and 12, that narrowly reaches the dorsum on 12 and covers the spiracle. A black lateral dash on joints 5, 7 and 9 to 11. Spiracles white, black ringed. Thoracic feet pale; abdominal ones purplish, entirely absent on joints 7 and 8. Tubercles and setæ minute.

Food plant *Menespermum canadense*. Dept. Agriculture, No. 2760. This larva mimics the excrement of birds.

38. **Thalpochares carmelita** Morrison.

Head 1.4 mm., black. Body somewhat thickened centrally; abdominal feet of joints 7 and 8 entirely absent. Setæ from very small tubercles, i short, ii and iii very long, pale, iv short, v moderate, vi and vii short but the hairs of vii longer on the legless segments. Body uniformly brown without marks; shields not differentiated. Skin shagreened, with large, clear, not contiguous granules. Thoracic feet black, the abdominal ones with black plates. Spiracles minute, entirely pale.

Food plant, *Gnappalium*. Dept. Agriculture, No. 4554. Bluffton, S. C. J. H. Mellichamp. A curious little larva, feeding concealed in the flower heads.

39. **Euclidia cuspidea** Hübner.

Head 3 mm., pale with numerous parallel brown stripes running toward the mouth from occiput. These form a broad shade over the centers of the lobes, leaving the sutures and clypeus yellowish, with narrow central brown shades. Behind the eyes the stripes are reddish and mottled. Body long and slender, feet of joint 7 absent, those of 8 small and short. Light brown, finely lined with many longitudinal dotted streaks both dorsally and ventrally. Dorsal line rather broadly pale, containing a double

reddish line; subdorsal region dark, mottled and paler on joints 8–10; sides pale to below spiracles; subventral region dark, reddish below, the center of the venter again pale. Feet pale, mottled; a ventral brown spot before the feet of joint 8. Spiracles brown, black ringed; tubercles and setæ small in blackish spots. There are about thirteen lines on each side of the body, each obscurely double.

Food plants, clover and grass. Dept. Agriculture, No. 2823.

40. **Catocala illecta** Walker.

Head 3.5 mm., purplish brown, mottled, a pale stripe behind base of eyes; three vertical black lines on each lobe, not attaining the summit and a line in the clypeus. Body finely transversely banded with purplish white and black, cut by a broad, white, substigmatal band and quadrate deep pink spots at the tubercles. There are about sixteen transverse black lines on each segment, irregularly in pairs, forming a dorsal rectangle above she spot at tubercle i, less distinctly so above ii and on the sides between these tubercles and iii. The pink spots of iii and iv are adjacent to the spiracle and rest on the white substigmatal band. Subventrally the black lines reappear, but the venter is uniformly pale reddish, except for a row of mid-ventral blackish blotches. Feet brown, plates blackish; cervical shield and anal plate reddish; spiracles black, very narrowly pale centered; tubercles and setæ minute. Feet almost equally developed.

Labelled in Dr. Riley's handwriting, but I find no record of the food plant or collector; possibly it was from J. Boll. This larva somewhat resembles the Agaristidæ.

41. **Catocala amestris** Strecker.

Head 3.4 mm., whitish with six vertical black lines on each lobe and one in the clypeus, broken at vertex by a yellowish spot, somewhat dotted on the sides of head. Body slender, purplish white, longitudinally lined with black. Medio-dorsal line narrow, purple; between it and the spiracles six narrow black lines on each side, the lower ones somewhat more closely spaced, all a little dotted, the lowest one broad and crossing the spiracles. A white substigmatal band, succeeded by a broken black line and another white band over tubercle vi; a black band along the bases of the feet; venter heavily black blotched. Feet and spiracles black; tubercles distinct, sordid yellow with pale setæ. Feet about equally developed.

Food plant, *Amorpha fruticosa*. Texas. J. Boll.

42. **Catocala hermia** Hy. Edwards.

Head 4 mm., large, scarcely retracted, the lobes somewhat bulging above before; red-brown, mottled, a black line from ocelli to vertex, the pair meeting above behind the bulgings of the lobes; clypeus somewhat sunken, a brown central line. Body slightly roughened, tubercles produced especially ii; a transverse dorsal ridge between ii on joints 9 and 12. Along subventral margin a fringe of secondary, root-like white processes. Brown, all the lines obsolete, reduced to a series of black

dots which are spread sparsely over the surface. Feet pale, the abdominal ones almost equally developed; setæ minute. Spiracles pale, black rimmed. A series of large, brown-black, medio-ventral blotches.

"Bred on willow." Placer Co., Cal. A. Koebele, No. 165. This larva resembles the bark of a tree.

43. **Siavana repanda** Walker.

Head 3.8 mm., full, thick, the clypeus small; green, slightly shagreened; ocelli pale. Body smooth, robust, green, finely uniformly peppered with red-brown. Tubercles and setæ minute; spiracles and feet pale. Feet about equal. The specimen is not as admirably prepared as Koebele's later work, but I think there were no other markings present.

Food plant, live oak. Florida. A. Koebele.

44. **Eubolina integerrima** Walker.

Head 4 mm., full, thick, not retracted; brownish-white with many black dots, segregated around the sutures and lower two thirds of sides, leaving the apices of the lobes pale with a separated spot in front. Body slender, but large, tubercles ii of joints 12 and 13 smoothly, conically produced; the feet of joints 7 and 8 rudimentary. Gray, a whitish ground, dotted and blotched with black. The numerous small round dots are sparser dorsally in the incisures of joints 5–6, 6–7 and 7–8, contrasted with a large black patch on each side, the remains of a subdorsal line that is traceable posteriorly, waved. Sides without distinct lines, dotted, some of the dots dull red. Venter paler, with medio-ventral dark blotches. Tubercles minute; setæ rather coarse, white; spiracles black; feet pale.

Food plant, live oak. Florida. A. Koebele. This larva resembles the bark of a tree.

45. **Hyamia perditalis** Walker.

Head 1.5 mm., pale brown, darker on the faces of the lobes, a little mottled. Body green with a broad, diffuse dark red dorsal stripe more or less distinct. Spiracles small, brown; tubercles minute, setæ pale; feet green, equally developed.

Food plant, *Cephalanthus*. Dept. Agriculture, No. 2849.

46. **Megachyta lituralis** Hübner.

Head 1.5 mm., pale brown, faintly reticulate with darker; a double brown band in clypeus, meeting above and a short band above each antenna, not contrasted. Body light yellow-brown, reticulated with dark red which forms distinctly a rather broad dorsal line and more narrowly oblique side stripes up from the spiracle reach forward to above the level of tubercle iii. Tubercles large, brown, in the pale parts of the surface; setæ short, pale. Feet pale, equal; spiracles black.

Food plant, dead leaves. Dept. Agriculture.

47. **Pityolita pedipillalis** Guenée.

Head 1.5 mm., greenish brown, finely reticulated with brown; sutures of clypeus brown. Body greenish, neatly reticulated with red-brown,

which forms a diffuse dark dorsal shade not strongly contrasted, and oblique lines as in the preceding species. Tubercles brown, in the pale parts of the surface; setæ short, pale. Feet pale, equal; spiracles black.

Food plant, dead leaves. Dept. Agriculture, No. 2585.

48. **Zanclognatha obscuripennis** Grote.

Head 2 mm., pale yellowish with brown reticulations, no distinct bands. Body yellowish with fine dark red reticulations crinkled and broken, forming no bands. Tubercles large, brown, in the pale parts of the surface; setæ short, pale. Feet equal; spiracles dark brown with very narrow paler centers.

Food plant, dead leaves. Dept. Agriculture, No. 2807.

49. **Bomolocha caducalis** Walker.

Head 2.3 mm., green, tubercle i black with a little dark blotch below the setæ is broken off in the specimen, so I cannot tell whether it was spathulate). Body slender, green, a faint white subdorsal stripe below tubercle ii. Tubercles large, a little elevated, reddish; setæ dusky. Feet pale, about equal; spiracles brown rimmed.

Food plant, walnut. Dept. Agriculture, No. 2841.

50. **Hypena modesta** Smith.

Head 1.6 mm., green, faintly brown dotted, rather prominent; tubercles distinct, brown. Body long and slender, the feet of joint 7 entirely wanting. Green, without perceptible lines. Tubercles large, conic, white, centrally dark with long, slightly dusky setæ. Feet pale; spiracles small, brown rimmed.

Food plant, nettle. Nevada Co., Cal. A. Koebele, No. 194.

From the species recorded in Bulletins 35 and 44 of the U. S. National Museum, it appears that only a fraction over 10 per cent. of the described species of North American Noctuidæ (exclusive of the Acronyctæ) have had their larvæ made known. The present article brings this proportion up to 13 per cent., but this is still too small to make the recognition of species from the larva alone feasible, so that a synoptic table of Noctuid larvæ would be of little use at this time. I have, therefore, simply thrown the species here described into synoptic form, to indicate the general lines on which our Noctuidæ may be separated when they are better known. This synopsis is also in part supplementary to the descriptions, as several of the more general characters here given are not repeated separately under each.

1. Tubercle iv (joints 7 to 10) behind the center or upper edge of spiracle 2
   Tubercle iv (joints 7 to 10) below the center of spiracle or lower. 32
2. Mottled with brown, the ground usually a lighter shade of brown, rarely greenish 3
   Green, lined with white, without brown shades.................... 29

3. No pale lines between subdorsal and substigmatal lines........ 5
A distinct pale lateral line 4
4. Subdorsal and substigmatal lines uniform.......23. *Dargida procincta*
Lines narrow and blotched in incisures ....35. *Xylomiges ochracea*
5. With blackish subdorsal oblique shades............ 6
With whitish oblique shades................. 3. *Rhynchagrotis crenulata*
Dorsal space broadly pale with blackish shades diamond-shaped or rounded or filling in all the space 10
Dorsal space not dark shaded 24
6. Joint 12 enlarged with a black patch behind, 1. *Rhynchagrotis rufipectus*
Joint 12 not unusually enlarged........... 7
7. Cervical shield concolorous, obscure 8
Cervical shield more distinct, dark, pale lined 9
8. Tubercles i pale, contrasted; body dark....2. *Rhynchagrotis alternata*
Tubercles i dark; body light brown ....4. *Eueretagrotis sigmoides*
Tubercle i in pale area, not contrasted; body uniformly obscured, 15. *Mamestra quadrata*
9. Substigmatal line broad, pale yellow..............29. *Orthosia purpurea*
Substigmatal line obsolete, covered by brown mottlings, 30. *Orthosia bicolorago*
10. Dorsal space at least in part pale 11
Dorsal space all blackish 22
11. Markings in dorsal space diamond-shaped.............................. 12
Markings rounded, linear or obscure.. 15
12. Cervical shield distinct.................................... 13
Cervical shield obscure, concolorous 16
13. A double row of subventral dark spots..........27. *Tæniocampa rufula*
Subventral region all pale.............................. 14
14. Cervical shield with lateral margin straight, incised, 6. *Feltia vancouverensis*
Cervical shield with lateral margins oblique ..11. *Mamestra meditata*
15. Cervical shield obscure, concolorous.. 17
Cervical shield distinct, shining.. 19
16. Head pale brown, all shining..............................26. *Orthodes vecors*
Head darkly reticulated, only the clypeus shining, 36. *Xylomiges patalis*
17. Dorsal shades elliptical, a dark superstigmatal band, 5. *Noctua bicarnea*
Dorsal shades diffuse; no contrasting superstigmatal band......... 18
18. Opaque; head with lines and reticulations....24. *Caradrina miranda*
More translucent; head nearly uniformly red-brown, 25. *Caradrina extimia*
19. Opaque, dark shaded, dorsal shades linear...15. *Hadena apamiformis*
More translucent, dorsal shades obscured.................................. 20
20. Head shagreened, dull..............................8. *Carneades brunneigera*
Head smooth, shining 21

21. Markings rather distinct, head and cervical shield dark red-brown, 9. *Carneades perexcellens*
Translucent, marks obscured; head and cervical shield black lined..10. *Carneades divergens*
22. Body roughened, uniformly blackish ......14. *Mamestra quadrilineata*
Body smooth, normal.. 23
23. Subdorsal line obscured, dorsal line pale......13. *Mamestra rubefacta*
Subdorsal line as distinct as dorsal one, spaces shaded, 17. *Hadena cuculliformis*
24. Thorax and joint 12 enlarged; a black subdorsal spot on joint 6, 21. *Oligia grata*
Thorax and joint 12 not unusually enlarged.............................. 25
25. Substigmatal line absent.. 26
Substigmatal line distinct 27
26. Red-brown and yellowish; subdorsal line distinct, 12. *Mamestra detracta*
Green with brown mottlings; no lines ....18. *Hadena relecina*
Translucent, sordid, no marks.. 28
27. Substigmatal line broad, filled in with red mottlings.................. 30
Substigmatal line narrow, yellow..........................33. *Jodia rufago*
28. Head red-brown, dorsum red shaded.............22. *Macronoctua onusta*
Head pale brown, body uniform.............................32. *Glæa inulta*
29. Substigmatal line broad, white.........................7. *Carneades wilsonii*
Substigmatal line narrow, white or yellow.............................. 31
Substigmatal line sharply narrowed in incisures, white, partly green tinted...19. *Hadena genetrix*
30. Substigmatal line broad, its edge sharp...................31. *Glæa olivata*
Substigmatal line moderate, diffused, not sharp.34. *Xylina carbonaria*
31. Substigmatal line below spiracles, red edged above, 20. *Hadena adnixa*
Substigmatal line above spiracles centrally, not red edged, 28. *Tæniocampa pacifica*
32. Feet absent on joints 7 and 8.. 33
Feet absent on joint 7... 34
Feet all present, though anterior ones often small....................... 35
33. Green with white lines (see species of *Plusia*).
Purple brown with white blotches......37. *Plusiodonta compressipalpis*
Uniformly brown without marks..............38. *Thalpochares carmelita*
34. Pale brown with dark lines; feet of joint 8 small, 39. *Euclidia cuspidea*
Green; feet of joint 8 like 9 and 10....................50. *Hypena modesta*
35. Feet on joints 7 and 8 small; marked like bark of tree, 44. *Eubolina integerrima*
Feet all about alike... 36
36. Green with white or red lines.. 37
Olivaceous, brown mottled, substigmatal line red centered.......... 27

Green, the white lines widened diamond shape. 29
Green with brown dottings ....43. *Siavana repanda*
Not green... 38
37. A white subdorsal line; skin smooth............49. *Bomolocha caducalis*
A dorsal red band only................................45. *Hyamia perditalis*
38. White substigmatal line distinct 39
No white substigmatal line... 40
39. Black lines transverse...40. *Catocala illecta*
Black lines longitudinal..................................41. *Catocala amestris*
40. With subventral fringe; resembling bark............42. *Catocala hermia*
Without subventral processes, small.. 41
41. Dorsal line present.. 42
Dorsal line absent, reticulations broken,
48. *Zanclognatha obscuripennis*
42. Yellow and brown; dorsal line strong..........46. *Megachyta lituralis*
Greenish and brown; dorsal line diffuse......47. *Pityolita pedipillalis*

A discussion followed of the structural features of the larvæ used in their classification, participated in by Messrs. Ashmead, Marlatt, and Dyar.

June 2, 1898.

Vice-President Gill in the chair, and Messrs. Patten, Ashmead, Pollard, Marlatt, Benton, Sherman, Currie, Sanderson, Motter, Pratt, Johnson, Howard, and Heidemann also present.

—Under the head of "Short Notes and Exhibition of Specimens," Mr. Pratt exhibited specimens of *Borus unicolor*, taken under bark of *Pinus inops* at Rosslyn, Va. The species had been found near Washington many years ago, but Mr. Schwarz had considered it to be practically extinct. He also showed specimens of *Orchestes ephippiatus*, taken on willow near Tennallytown, D. C. Apropos to extinct species, Dr. Gill spoke of the supposed extinction of *Lophelatelus chameleonticeps*, formerly very abundant, and which for years was never seen, even in a single specimen. Within the last three years, however, it has become abundant once more in the old region. Mr. Ashmead instanced *Cynips notha* O. S., a species which for 35 years had not been taken. The present spring it was re-discovered by Dr. Dyar and shown to belong to the genus Neuroterus.

—Mr. Benton exhibited a bee impaled on a thorn, and discussed once more the question as to whether such impalements may be brought about by any other cause than the shrikes. In his opinion certain bees are thus impaled by being driven against thorns by the force of the wind. He showed that in a locality near his house (Berwyn, Md.), the shrikes do not occur; that the bees are all impaled upon one side of a locust tree, and that this side of the tree is in the direction of the strong north winds. The subject of the impalement of insects was discussed at length. Mr. Johnson spoke of the habits of the southern shrike which he had studied most carefully in Maryland, and upon which subject he proposes to present a lengthy paper at a near meeting of the Society. In his opinion insects found impaled are nearly always the result of the work of this bird. Apropos to the reason for the habit of the shrike in impaling insects and other animals, Dr. Gill said that he considered it a remnant of a providential instinct like the burying of bones by dogs, and like the storing of unnecessary honey by bees in the tropics. Mr. Ashmead corroborated Mr. Johnson's observations on the shrikes from his own experience in Florida. Mr. Johnson said that in his experience insects impaled by shrikes were very firmly fixed, the thorn extending clear through the body, whereas the specimen exhibited by Mr. Benton was but slightly pierced by the thorn, this fact lending color to Mr. Benton's theory that the insects had been blown against the thorn. Mr. Patten said that the impaling habit of the shrike was supposed to be due to the fact that the feet ot this bird are weak, and that its food was impaled in order that it might be held firmly while the bird was eating it or tearing it to pieces. The subject was further discussed by Messrs. Howard, Marlatt, and Pratt.

—Mr. Howard presented the following note:

BUTTERFLIES ATTRACTED TO LIGHT AT NIGHT.

By L. O. Howard.

At 9 o'clock on the evening of June 6, 1893, in West Washington, D. C., the writer caught a fresh male specimen of *Eudamus tityrus* which had flown into the lighted room and established itself on a white curtain. Upon investigation he found that the observation was novel for this species, and published a

short note about it on page 355 of Volume V, *Insect Life*. There seems to be but one record of a similar attraction of a butterfly at night to an ordinary light. This is the instance mentioned by Miss Murtfeldt, in *Psyche*, Volume IV, page 206, in which she states that after 10 o'clock on the evening of August 20, 1882, a perfect specimen of *Apatura lycaon* flew in at the window of her sitting room and was captured with a butterfly net. Another example of the same species was taken earlier in the evening, but after the lamps were lighted. Exceptionally bright lights have, however, more often been known to attract butterflies. Mr. S. H. Scudder, in *Psyche*, Volume I, page 28, records the occurrence of *Grapta j-album* in numbers at the lantern of the flash-light on the island of Nantucket. At the meeting of the Brooklyn Entomological Society of October 6, 1885, Mr. Henry Edwards stated that he had been informed by Dr. C. Hart Merriam that the light-house keeper on Lake Ontario had been greatly annoyed by the large swarms of *Anosia plexippus* which flew against the light and obscured it (*Entomologica Americana*, Volume I, page 160). At the same meeting Mr. Edwards called attention to the fact that the electric light, since its introduction, had been observed to attract butterflies occasionally. He had observed *Papilio troilus*, *Vanessa atalanta*, *V. cardui*, *V. huntera*, *V. antiopa*, *Anosia plexippus*, and *Cyaniris pseudargiolus*. The principal object of this compilation of instances is the recording of the fact that at midnight, May 25–26, 1898, a fresh specimen of *Pholisora catullus* was caught by me flying about the gas jet in my house in West Washington, D. C. Speaking of the instance the next day to Dr. W. J. Holland, he informed me that while Satyridæ and Hesperidiidæ in the tropics fly in dark woods, and are occasionally seen at twilight, such instances as that recorded above are very rare. Of our North American species he considers *Eudamus tityrus* to be the latest flyer. Nearly all of our northeastern butterflies, as pointed out by Scudder, however, are found abroad before 7 or 8 in the morning of a summer's day, and long before nightfall, with closed wings and antennæ snugly packed between, they are quietly resting beneath some leaf or clinging to some grass blade. The observation on *P. catullus* is entirely new, and is to be explained like the previous one on *E. tityrus* and Miss Murtfeldt's observation as well, by the fact that the butterflies had gone to sleep near the window and were rudely disturbed by some nocturnal bird or animal.

The subject was discussed by Messrs. Ashmead, Marlatt, Johnson, and Pratt, all of whom had collected extensively at

electric lights, and none of whom had ever found a butterfly to be attracted to these lights.

—Mr. Howard also presented brief notes on *Rasahus thoracicus* Stal. and *Xylocopa cubæcola*. The Rasahus is a ferocious Piratine bug, which was one of the very few insects attracted to light at San Jose de Guaymas, Mexico, in the early part of April. It flew through the open windows in considerable numbers and lighted upon the supper table. It was well known to the house-owner, who remarked that it was not to be touched, for it would "sting like the ze dev." The speaker was quite inclined to accept this statement and did not experiment. The Xylocopa he found flying abundantly about the flowering trees in the plaza of the city of Guaymas, where, during the dry season of early April, it was almost the only insect to be seen. At the rancho at which he stayed, at San Jose de Guaymas, this insect was busily engaged making its nests in the large reeds with which the porch was thatched. It was present there in great numbers, and the air was filled with its loud humming. It is a large and conspicuous blue-black species, with very dark wings, originally described from Cuba but also found by Mr. Fox in the collections made by Dr. Eisen, in Baja California.

Some discussion ensued on the biting powers of bugs of the Piratine group and allied Heteroptera, participated in by Messrs. Johnson, Ashmead, Gill, Marlatt, and Motter. It was shown that while there is no specific poison gland in these insects, there is an effect from their bite which is more severe than it would be if the puncture were purely mechanical. This effect is attributed to the moisture of the mouth-parts produced by the salivary glands.

—Mr. Howard further presented some notes upon the occurrence of *Dichelonycha fulgida* swarming about the rear end of a train over the Southern Pacific Railroad near Banning, Cal., the train traveling at the rate of 20 miles an hour, and the beetles flying in a continuous swarm about the green flag on the end of the rear car.

—He also spoke of the percentage of parasitism of *Lecanium armeniacum*, at San José, Cal., by *Comys fusca*, nearly all of the specimens of this scale in a large prune orchard being destroyed by this Chalcidid parasite. Specimens of both the scale and the parasite were shown.

—The final paper of the evening was read by Mr. Ashmead, and was entitled "Some Important Characters in the Classification of the Bees."* He called special attention to the mouth-parts and the wide structural difference to be found in them. He also pointed out the morphological significance of some slight differences in venation. He also spoke of the absence or presence of the tibial spurs and their shape, as well as the difference in the development of the labrum—characters he considered to be of great importance in classification. Figures showing several characteristic types of mouth-parts, as well as the front wings of many representative bee genera, such as *Apis*, *Mellipona*, Bombus, Xylocopa, Podalarius, Megachile, and Andrena, were exhibited. The differences to which he drew especial attention he considered of great taxonomic value, and he has made these, correlated with other characters, the basis for separating the bees into twelve distinct families.

October 20, 1898.

The 137th regular meeting was held at the residence of Mr. Wm. H. Ashmead, 1821 Q street N.W. Vice-President Gill occupied the chair, and Messrs. Schwarz, Patten, Ashmead, Webber, Cook, Marlatt, Kenyon, Dyar, Pratt, Motter, Benton, Pollard, Howard, Busck, Johnson, active members; Messrs. Casey and Cooley, corresponding members, and C. O. Townsend, F. E. Chapin, Rene Bache, and Dwight Sanderson, visitors, also present. Mr. F. Matthes, Washington, D. C., was elected an active member, and Mr. R. A. Cooley, Amherst, Mass., a corresponding member.

—Under the head of "Short Notes and Exhibition of Specimens," Mr. Pratt exhibited a specimen of *Phyciodes tharos* which had been taken at electric light at night.

—Mr. Schwarz showed a dry flower stem of the Arizona bear-grass (*Nolina* sp.), showing the work of the Buprestid beetle *Thrincopyge ambiens* Lec., the single stem indicating the entire life-history of the beetle, which works in the center and does not

* To be published elsewhere.

appreciably injure the plant. Some discussion followed upon the bear-grass and the allied yuccas and Dasylirions of the arid region, more particularly in regard to the destruction of flower stalk by cattle in spite of the especially protective growth.

—Mr. Heidemann showed three species of Aradidæ new to the District of Columbia, viz., *Aradus crenatus* Say, *A. breviatus* Bergr., and *A. inornatus* Uhl., with comments upon their habits and characters. He also showed specimens of *Calisius pallices* Stål., from Florida, a species hitherto known only from South America, and which must now be added to the fauna of boreal America. Mr. Ashmead remarked that he had found this last species under the bark of dead orange trees killed by frost.

—Mr. Howard called attention to an outbreak of the chinch bug upon lawns in the city of Brooklyn during the months of July and August last, pointing out that the sudden appearance of this insect in enormous numbers in the center of a densely populated city hundreds of miles from any previous point of destructive appearance and in the middle of a summer characterized by excessive precipitation and upon closely cut lawns which had been frequently watered, afforded an instance entirely unprecedented in the history of the species.

—Dr. Dyar read the first paper of the evening, entitled "Notes on Acronycta and their Larvæ," in which he spoke of a forthcoming work prepared by himself and Dr. J. B. Smith.* He called especial attention to the fact that his own classification of the group from the larvæ coincided in a remarkable manner with Dr. Smith's classification of the group derived from the study of the adult characters only. He showed that the larvæ may be divided into three main groups, and illustrated his remarks by the exhibition of specimens.

The paper was briefly discussed by Messrs. Casey, Gill, Howard, Cook, and Kenyon. In reply to a question by Mr. Howard, Mr. Dyar stated that he had applied the results obtained by Dr. Chapman, of England, in the classification of the pupæ of this group to our North American species with admirable results, but that there was not as close a parallel between Chapman's classification of the pupæ and Smith's classification of the adults as he had found to exist between his own work on the larvæ and Smith's

* Published in Proc. U. S. Nat. Mus., Vol. XXI, 1898, pp. 1-194.

upon the adults. Captain Casey remarked upon the extreme contrast in the large size of the larvæ and the small size of the adults in a number of the specimens exhibited, and there was some discussion upon this phenomenon in other groups. Dr. Gill stated that this disproportionate size of the larvæ occurs markedly in the Surinam frog as well as with the common eel and the Conger eel. In fact, with all apodal fishes the difference is so striking that the larvæ in some cases have been referred to a different order from the adult. Mr. Schwarz spoke of the same fact among the Coleoptera, the only exceptions to the rule of the superior size of the larvæ being among the Carabidæ, where all except the Harpalinæ have the full-grown larvæ apparently smaller than the adult. This inferiority of size, however, is only apparent since the removal of the elytra of the adults shows in reality a smaller body. The most remarkable cases of the greater size of the larvæ occur in the Passalidæ. Among the Phengodidæ, what he takes to be the true larva of the male of one species is very much larger than the adult. Dr. Gill, in speaking of the extreme differentiation among the larvæ of Acronycta as contrasted with the similarity of appearance among the adults, stated that this afforded an added proof to his mind that the larval stage is a secondary condition and not a primary one. Mr. Cook said that in his opinion nothing could be plainer than the proof, all through the Insecta, that the larva is an intercalated stage. As bearing upon this subject, Dr. Kenyon spoke of the variation in the hatching point, in the course of development, showing that in Myriapods of different groups the young may hatch at very different stages of development, some having only three pairs of legs when hatched and adding others in the course of growth, while others have five pairs, and still others twelve pairs on hatching.

—Mr. Schwarz spoke of "Southern Arizona and its Insect Fauna." He reviewed the topography of Arizona, indicating the exact points at which satisfactory collections of insects have been made. The most salient feature of the insect fauna of this region is that the time of appearance or activity does not depend upon the increase of temperature as in the more eastern portion of the country, but is governed by the increase of humidity. By far the greatest portion of the insects, and among them the most characteristic genera and species, do not make their appearance before the beginning of the rainy season in July or August.

NOVEMBER 3, 1898.

The 138th regular meeting was held at the residence of Mr. E. A. Schwarz, 230 New Jersey Avenue N.W. Vice-President Dr. Gill was in the chair, and Messrs. Schwarz, Benton, Marlatt, Dyar, Busck, Ulke, Caudell, Pollard, Uhler, Heidemann, Ashmead, Howard, and Vaughn were also present. The minutes of the last meeting were read and approved, and the Corresponding Secretary submitted his usual report. Messrs. F. E. Chapin and A. N. Caudell were elected active members.

—Under the head of "Exhibition of Specimens and Short Notes," Mr. Heidemann showed a remarkable Tingitid from the Santa Rita Mountains, Arizona, collected by Mr. Schwarz, which is identical with a species described from Panama, by Champion, as *Dichocysta pictipes*. He also showed a specimen of *Dolichocysta venusta*, in both the long-winged and short-winged form; the former from Montana, and the latter from San Diego, Texas. He also showed a specimen of *Jalisus multispinus* Ashm. which has been collected at the District of Columbia, and commented at length upon its systematic position. Some discussion ensued as to the relationship of Jalisus and allied genera by Messrs. Ashmead and Uhler.

—Mr. Schwarz exhibited a small brightly colored moth of the family Pyromorphidæ, and a Lampyrid beetle (*Lycus fernandezi*) which almost precisely resembled the moth, both from southern Arizona. He stated that the apparent mimicry is so exact that when flying together the insects cannot be distinguished. They fly together in very considerable numbers, about every sixth specimen being a beetle. He thinks that the beetles are themselves deceived by the appearance of the moths, and think that they are flying with their brothers and sisters. Apropos to these specimens, Dr. Dyar stated that while the moth exhibited was a Pyromorphid, the one showed a year ago by Mr. Schwarz, as resembling this same beetle, was an Arctiid; he further said that in the same general region there is a Syntomeid which partakes of the same resemblance, bringing about a strange complication of the mimetic relationship. Mr. Caudell said that at Stillwater, Oklahoma, he had occasionally seen a Lampyrid beetle similar to the one shown by Mr. Schwarz flying in large numbers on the

prairie about stunted oaks. In their flight they so precisely resembled moths as to deceive him. In reply to a question Mr. Schwarz said that he had found, in Arizona, the larvæ of two species of Lycidæ (Lycus and Lycostomus) congregating in large numbers under bark. When young, he thinks that they feed underground on snails.

—By invitation, Mr. Uhler spoke of the progress of his work upon the Capsidæ, stating that the forms have been coming in rapidly from the southwest, and from Mexico and South America, and that he is beginning to find that many of our forms have a much more southern origin than has hitherto been supposed. He gave several examples, mentioning, among other things, a species from Argentina, which is identical with a North American form which extends into Maryland. Extensive collections from below the Amazon have come into his hands, and he welcomed the expedition now being made by Messrs. Smith and Baker to Columbia and Venezuela, since it is intervening territory. He further complimented the Colorado collections of Mr. C. F. Baker in the highest terms.

—Mr. Schwarz showed a bundle of bear-grass (Nolina) leaves which he stated makes the best fly flap known; it not only kills the flies but cuts off their heads, legs, and wings.

—Mr. Howard read a paper entitled "An Insect Breeding in Petroleum," showing that an Ephydrid fly, described by Mr. Coquillet, in connection with this paper, as *Psilopa petrolei*, breeds in large numbers in crude petroleum pools in the neighborhood of oil wells, near Los Angeles, Cal.* In discussing this paper, Mr. Marlatt suggested that crude petroleum may not have the same insecticidal qualities as the refined petroleum products on account of the presence of a greater quantity of paraffine giving it a fatty nature; the idea was suggested to him by the fact that maggots will live without difficulty in very fat pork, for example. Mr. Schwarz suggested that as the pools in question are accidental, the result of establishing oil wells, this habit of living in pools may be a recently acquired one.

—Mr. Schwarz continued his paper of the previous meeting on "Southern Arizona and its Insect Fauna." He spoke espe-

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cially of the sharp demarcations in faunas and floras in Arizona on account of the extremely variable altitudes, including isolated peaks of considerable height and very low-lying desert regions. The complexity of the life zones is thus more marked than elsewhere in the United States. He described at some length the characteristic features, both botanical and entomological, of the region mentioned, showing, among other things, that Dr. Merriam's conclusion that the valley of the Colorado river is tropical is not substantiated by a study of the insects.

Inasmuch as many of the insects upon which Mr. Schwarz had based his conclusions were captured at light, Mr. Howard asked whether the species so collected were the best which could be chosen to determine faunal limitations. Mr. Schwarz replied that in that region a very great variety of insects is attracted to light, beetles of almost every family being attracted in this way. Mr. Ulke stated that in the East it is the beetles of the Lamellicorn series which are most numerously attracted to light, and Mr. Schwarz said that in Arizona even Cicindelidæ and water-beetles (even where there is no water for many miles) are thus attracted.

Mr. Howard referred to the fact that the tropical region of the Colorado valley is extended by Dr. Merriam, in his recent maps, far down the coast of Mexico along the eastern side of the Gulf of California, but stated that from the determinations so far made of a small collection of insects which he took at Guaymas during the dry season in April of the present year, there was absolutely no indication of a tropical fauna. Dr. Gill spoke of the land shells of the Colorado river valley, and said that they afforded no indication of a tropical fauna. Mr. Pollard said that with the exception of a few characteristic plants the flora of the valley is not tropical; that is to say, it is not in the least comparable to the tropical regions of the Florida Keys and the southern tip of Texas about Brownsville. Mr. Schwarz, however, stated the fact that there is a distinct difference between an arid tropical flora and a humid tropical flora, instancing the flora of the extreme tip of Lower California as a good example of arid tropical. Prof. Uhler spoke of the genus Pachylis as an example of an arid tropical insect, feeding upon Opuntia, and distributed throughout South and Central America, coming as far north as Fort Grant, Arizona. He instanced several tropical genera among the He-

teroptera which extend well up into Arizona, and Mr. Ashmead also mentioned several tropical genera of Chalcidids which extend up into Texas and Arizona. Dr. Gill said that the extension of the range of a few genera northward in this way must not influence our estimate of the character of the fauna as a whole. He showed that several genera in other groups have this same extension of range, the peccaries being a marked example. He showed, further, that even in individual genera we have a distinction between species living at low and high altitudes. He showed that there is a low-living tapir, for example, and one which lives at comparatively high altitudes. He further instanced the extension of the jaguar and the armadillo, both tropical animals, into Texas. Mr. Schwarz, referring to the Pachylis mentioned by Mr. Uhler, said that in the larval condition this lives on mesquite, and that the adults are attracted to the flowers of *Yucca elata* and *Y. macrocarpa* in great numbers. They do not seem to be injurious to the buds, as the flowers open without evidence of damage, though they have been visited by the bugs for many days.

December 1, 1898.

The 139th regular meeting was held at the residence of C. L. Marlatt, 1440 Massachusetts avenue. Vice-President Dr. Gill in the chair, and Messrs. Judd, Chapin, Dyar, Cook, Caudell, Busck, Ashmead, Patten, Motter, Matthis, Schwarz, Heidemann, Benton, Howard, Marlatt, Vaughan, Johnson, Sherman, active members, and A. D. Hopkins, corresponding member, also present.

—Under the head of "Election of Officers," all of the officers serving during 1898 were re-elected for the year 1899. E. Dwight Sanderson, of College Park, Maryland, was elected an active member.

—Under the head of "Exhibition of Specimens and Short Notes," Mr. Schwarz spoke of the Scolytidæ of Arizona, showing that 32 species had been collected in southern Arizona by Mr. Hubbard and himself. In his opinion these constituted a fair representation of the Scolytid fauna of the southern portion of the State, although there will probably be other forms inhabit-

ing the pine regions. Most of the coleopterous enemies of the Scolytidæ in Arizona are totally different from such forms in the eastern United States.

—Dr. Hopkins, by invitation of the chair, presented some notes on Scolytidæ, with especial reference to habits. He showed the male of Hypothenemus, which is relatively of extremely small size, and is rare. *H. dissimilis* breeds in dead twigs, where the larvæ appear to consume a kind of ambrosia. In the first lot of eggs deposited only one is a male, and this apparently is the only male in the number of successive broods developed as a product of a single female. There is, therefore, intense polygamy and in-and-in breeding. Further notes were given on the habits of *Cnesinus strigicollis* breeding in apple twigs, also on *Pityophthorus minutissimus*, and *Scolytus rugulosus*, showing that the larvæ of Scolytids are sometimes killed by not very severe freezing, from which he considered that the remarkable disappearance of *Dendroctonus frontalis* in 1893 was due to the severe freeze of December, 1892, and January, 1893. He mentioned a stridulating sound made by *Dendroctonus terebrans* by rubbing the dorsal margin of the last abdominal segment against the inner surface of the elytra near the tips. The sound is apparently produced by a vertical movement of the abdomen, which causes the rubbing together of finely striated surfaces between the overlapping posterior sutures of the propygidium and the antepenultimate segment, also of the sutures of the third and fourth segments from the tip. He recorded the finding of *Dendroctonus simplex* breeding in the American larch, in West Virginia, at an elevation of 2,600 feet, and concludes that *D. simplex* may yet prove to be distinct from *D. rufipennis*. He further presented some interesting notes on the insect enemies of Scolytidæ.

This communication was discussed by Messrs. Schwarz, Howard, Ashmead, and Johnson.

Mr. Ashmead stated that all of the European parasites of *Scolytus rugulosus* have now been found in the United States, the first one, *Chiropachys colon*, having been recognized 20 years ago by Dr. Howard.

Mr. Johnson stated that he had studied *Scolytus rugulosus* in the orchards of Maryland during the past few years. He found that it attacked plums and peaches with great virulence, but he

had always noticed that the trees thus attacked had always been damaged in some way, either by being barked in process of cultivation or by a branch being broken, or by some unknown cause. He had seen the *Chiropachys colon* in considerable numbers, and had observed a curious habit in this insect in that both male and female, when about to mate, posture before each other, vibrating the wings. One orchard of about 600 trees of the satsuma plum had been extensively infested by *S. rugulosus*. The trees died from some perfectly obscure cause, which neither he nor Mr. Woods, of the Division of Vegetable Pathology, had been able to ascertain, and were immediately attacked in great numbers by the Scolytids.

Dr. Hopkins stated that this beetle will attack, for food, the buds of perfectly healthy trees, and in this way bring about so great an injury as to induce a breeding attack of the same insect.

This statement was confirmed by Mr. Schwarz, who said that in his opinion the insects of the genus Scolytus will attack perfectly healthy trees. He instanced the case of *Scolytus quadrispinosus* on perfectly healthy hickory trees at Detroit, Mich. These were old but perfectly healthy trees, and they were not appreciably damaged by the insect. At Mt. Airy, Ga., he had seen an apparently perfectly healthy peach tree suddenly attacked by Scolytus for feeding purposes. The feeding punctures can always be distinguished from the breeding punctures by the fact that they occur in circular rows.

Mr. Johnson stated that very few of us are able to ascertain what is a perfectly healthy tree, and that he was certain that in his experience some injury, however obscure, preceded attack by this insect.

—Mr. Ashmead spoke of and illustrated by diagrams some important structural characters in the Crabronidæ. He had recently devoted some weeks' study to the insects of this family, and called attention to the excellent use which may be made of characters in the mandibles, palpi, antennæ, frontal fovea, clypeus, wings, abdomen, pygidium, and legs. He would give generic rank to the subgenera of Fox and Kohl, and would divide the family into four subfamilies. He showed that all of the Fabrician species of Crabro, 17 in number, have been placed in other genera, and he finds himself embarrassed to indicate the type of the genus Crabro.

The paper was discussed by Messrs. Hopkins, Cook, and Gill.

Mr. Cook discussed briefly some of the general principles in classification, referring to the fallacy of speaking of the *value* of characters. The characters which we may observe are simply aids in classification. We will find species varying in certain respects, and there may be a chain of such variations, but Mr. Ashmead, in puzzling over the relative value of variations, has unnecessarily troubled himself.

Dr. Gill referred to the evolution of genus-making. Linnæus, he said, was a good botanist but a poor zoologist, and it was unfortunate for zoology that the work of Linnæus for so many years had such a vogue and was considered so important. He discussed the progress of the subdivision of the Linnæan genera in different groups, stating that in zoology, as a whole, we are still in the analytical stage of development. Thirty years ago he himself was considered an iconoclastic outcast by other workers in fishes, but at the present time all of his genera are accepted and he finds himself in the majority. He bade Mr. Ashmead to go ahead and to trust in the future for the substantiation of his divisional work. This future, he thought, would be near, as the tendency of the times is in this direction. He further spoke of the method of delimiting the type species of the Fabrician genus Crabro.

Very sincerely yours
Henry G. Hubbard

JANUARY 12, 1899.

The 140th regular meeting was held at the residence of Dr. L. O. Howard, 1336 30th street. Vice-President Gill in the chair and Messrs. Motter, Sanderson, Dyar, Ashmead, Judd, Caudell, Pollard, Schwarz, Marlatt, Heidemann, and Howard also present. Mr. E. L. Morris was elected an active member of the Society, and Dr. H. G. Dyar was nominated as Vice-President of the Washington Academy of Sciences for the Entomological Society.

Under the head of Exhibition of specimens Mr. Schwarz showed a true queen of an undescribed species of Termes which had been found by Mr. H. G. Hubbard in Madera Canyon of the Santa Rita Mountains, Arizona, in June, 1898. This is the first true Termite queen which has been found in North America.

—Mr. Heidemann exhibited a species of the genus Hoplinus found by Mr. Schwarz in southern Arizona (Santa Catalina Mountains). This is a curious species thickly covered with spines, on account of which Mr. Ashmead suggested that as the vegetation of that region is spiny, the presence of this armatured bug indicated a case of protective resemblance. A long discussion ensued on the subject of mimicry and protective resemblance among insects, participated in by Messrs. Gill, Ashmead, Judd and Howard, Dr. Gill objecting to the use of the term "mimicry" on the ground that it apparently implies volition on the part of the species.

—Dr. Dyar presented some notes on the phylogeny of the Lasiocampidæ. Apropos to Mr. Tutt's recent article on the subject he had gone over the group and established a genealogical tree based principally upon the larval characters and the wing venation. The discussion of this paper took the form of a continuation of the subject of protective resemblance suggested by Dr. Dyar's remarks about the larvæ of this group of Lepidoptera, especially in relation to the sub-lateral structures developed as a means of eliminating the shadow cast by the caterpillars, consisting in one group of larvæ of a longitudinal white line and in others of lateral processes. Further discussion by Messrs. Gill, Ashmead, and Dyar considered the larval characters in the Lepi-

doptera, Dr. Dyar stating that the most generalized larva is tuberculate, tubercules being lost and secondary hairs being developed in the process of specialization.

—Mr. Schwarz read a short note by Mr. H. G. Hubbard on the luminosity of a larviform Coleopter supposed to be the female of *Mastinocerus opaculus*. A few specimens were observed by him at Oracle, in southern Arizona, moving about quite actively during night time on the gravelly ground. In general aspect they greatly resemble the females of Phengodes but are more cylindrical and differ in the arrangement of the luminous parts. Two very large spots on the head are very brightly luminous, but the luminous areas on the abdomen are much smaller and less bright than in Phengodes. Mr. Schwarz supplemented Mr. Hubbard's note by general remarks on the females of Lampyrid beetles. Discussion followed, relating especially to the question as to whether luminosity in the Lampyridæ is a specialized condition, Dr. Gill taking the stand that from its more or less isolated occurrence in several groups of this family it is more likely to have been an original condition which has been lost perhaps by a majority of species in the process of specialization, calling attention to the analogy between this phenomenon in the Lampyridæ and Elateridæ and the phenomenon of electricity in the fishes, occurring as it does here and there in several groups. Mr. Schwarz stated that the relationship between the luminous Lampyridæ and Elateridæ was closer than perhaps has hitherto been suspected, and called attention to the fact that the larviform female of Phengodes was originally considered by Osten Sacken and others as an Elaterid. Mr. Howard considered that from the fact that the species which lack this physiological quality correspond to the normal coleopterous type and that the larviform females possess what may be termed highly degradational characteristics comparable to those acquired by a life of parasitism, for example, the luminosity should probably be considered a high specialization of comparatively recent origin.

—The final paper of the evening was presented by Mr. Howard, who exhibited a series of Australian insects of economic importance, and made a brief statement of the present condition of economic entomology in the Australian colonies. He called especial attention to the fact that the introduction of agriculture on a large

scale in this comparatively new region had resulted in the attacks of many native species upon cultivated crops. The specimens shown had been sent him by Mr. W. W. Froggatt, the Entomologist of the Department of Agriculture of Sydney, New South Wales, and included a number of species of great economic importance. He noted the curious habit of the apple root-borer (*Leptops hopei*) in laying its eggs in the folded leaf of the apple and newly hatched larvæ dropping to the ground and entering the roots; the damage done by the orange bug (*Oncoscelis sulciventris*); the vine moth (*Agarista glycina*) and a number of other species, showing, among other things, that the so-called climbing cut-worm named by Mr. Froggatt *Plusia vertiserrata*, is apparently our North American *Prodenia lineatella*. In briefly discussing this paper, Mr. Schwarz drew a comparison between the large number of native species which, by a change of habit, have attacked cultivated crops in Australia and the extremely small number which have similarly changed their habits in our own Northwest. He recalled no native species in Washington and Oregon which have become crop pests.

January 28, 1899.

A special meeting of the Society was held January 28, 1899, in the office of the Entomologist of the U. S. Department of Agriculture. The First Vice-President, Dr. Gill, in the chair, and Messrs. Marlatt, Banks, Schwarz, Chittenden, Ashmead, Clifton, Dyar, Heidemann, Cook, Coquillett, Currie, Benton, Pratt, Caudell, Howard, and Chapin also present. The Secretary read the following preamble and resolutions, which had been drawn up by Messrs. Cook and Benton, and which were, on motion, unanimously adopted:

Whereas, The Etomological Society of Washington has learned with profound sorrow of the death of its President, Mr. Henry Guernsey Hubbard, be it, therefore,

Resolved, That while we may not lament the release of our friend and co-worker from pain and weakness, we yet deplore the loss of one in whom we recognized the highest qualities of

intellect and personality. Though denied strength of body or length of days, it has been his high privilege to love nature and to extend widely the bounds of human knowledge. Possessed of unrivalled powers of observation and depth of insight, broad culture, accurate judgment, and a kindly spirit, he has lived a life and accomplished a work which render his memory secure in the affectionate regard of his contemporaries, as well as in the unqualified admiration of all naturalists who maay follow in the lines of his unique studies.

Resolved, That the Society, through its Secretary, transmit to the family of our late President this expression of its appreciation of his noble qualities, and of its sincere sympathy in the deep sorrow of a loss so irreparable.

Resolved further, That a committee be appointed to prepare a biographical sketch of our late President for publication in the Proceedings of the Society.

Some extended remarks were made by Messrs. Gill and Schwarz on the character and work of Mr. Hubbard, the Acting President appointing a committee, consisting of Messrs. Schwarz, Howard and Cook, to prepare the biographical sketch mentioned in the third resolution.

HENRY GUERNSEY HUBBARD.

Henry Guernsey Hubbard, sixth President of this Society and the third to be removed by the hand of death, breathed his last at Crescent City, Florida, January 18, 1899. He was born at Detroit, Michigan, May 6, 1850 His father, Bela P. Hubbard, a prominent citizen of Detroit, and a man of strong scientific tendencies, was one of the founders of the American Association for the Advancement of Science and was deeply interested in botany, forestry, arboriculture, and archæology. His mother was of German descent, and from both parents Henry Hubbard inherited a love of nature. As a mere boy he was well acquainted with the life-habits of the birds, mammals and other wild creatures about

Detroit. His early education was gained at a private school in Cambrige, Massachusetts, and for several years under private tutors in Europe. He entered Harvard University in 1869. Here he immediately came under that great group of teachers including Agassiz, Asa Gray, and Shaler, and the tendency of the course of his life towards natural history became fixed. The especial direction which his tastes took towards entomology was probably determined by the influence of Hagen, who had for a few years been working at Harvard, and of Osten Sacken, who was, in the early seventies, a volunteer assistant at Harvard working over his own and Loew's collections of Diptera and who took an active interest in the establishment of the Museum of Comparative Zoology. The temporary presence at the Museum at this time of G. R. Crotch and E. A. Schwarz directed Hubbard's attention towards field work in entomology, which had been much neglected in this country up to that time. Hubbard at once began work in this direction, which showed how much could be done in this way even in the vicinity of Cambridge. Already, at this early date, he began a system of careful and neat mounting and scientific labelling of specimens which put to blush the carelessness in this regard which prevailed in American collections. He practically invented the present labelling methods, the full value of which was not realized until years afterwards, when geographic distribution began to receive careful attention.

He graduated with the class of 1873, and his thesis was of a dual nature, comprising the study of the economy of *Telea polyphemus* and of the beetles and parasites living under the bark of the elm. Here he showed the same close powers of observation which characterized his later work. The winter of 1873–4 was spent as a post-graduate student under Hagen, and, with Schwarz, he made a study of the hibernation of Coleoptera, ascertaining many novel facts and finding in numbers species not previously known to occur there. Thus was introduced a new and scientific mode of collecting. The results of this winter's work is preserved at the M. C. Z. as the "winter collection."

The death of Agassiz, however, among its other sad results, put an end for a time to entomological activity at the Cambridge Museum, and Hubbard and Schwarz went to Detroit in May, 1874, and began the great Hubbard and Schwarz collection re-

cently donated to the United States National Museum. The results of this collecting during the summer and fall at Detroit and during the following winter in Florida were ready for exhibition at the first Detroit meeting of the American Association for the Advancement of Science held in August, 1875, and at once attracted the attention of the visiting entomologists. This was a notable gathering. For the first and only time an entomologist, Dr. LeConte, was president of the Association. Of the group of men who shared the hospitality of the Hubbard mansion, LeConte, Riley, and Lintner are gone; but Osten Sacken, Grote, Scudder, and others will remember the hours spent in the little wooden museum building on the Hubbard place.

In 1876 Hubbard commenced a series of expeditions to the Lake Superior region, and other similar expeditions were made in 1877 and 1878. Mr. Schwarz accompanied him on the first two, and the entomological results are summed up in the well-known paper entitled "The Coleoptera of the Lake Superior Region." In the early part of 1877 he accompanied his uncle on a trip to Jamaica. This was not a collecting trip, but his observations made on the Jamaican Termites, published by Hagen, are evidence of the fact, which later became so pronounced, that nothing could deter him from making entomological investigations which, from his keen insight and persistence, were always of lasting value.

In 1879 he accepted the position of Naturalist to the Geological Survey of Kentucky, then under Shaler's direction. Work was then being done in the Cumberland Mountains, and Hubbard at once became interested in the fauna of the caves which abound in that region. This interest increased, and he conducted further studies of the caves in the center of the State. Some of the results were published in his oft-quoted article, "Two days' collecting in the Mammoth Cave," a paper which marked the real beginning of our knowledge of insect cave life.

A terrible calamity to the Hubbard family occurred at this time. Two of his brothers were drowned in a sailing accident on Lake St. Clair, and this altered his future career. One of these brothers owned a place at Crescent City, Florida, and Hubbard was called upon to look after this property. This sad accident was, therefore, indirectly the cause of the fact that Crescent City has become so well known, in fact, so famous a name in entomological literature.

In 1880 the Government was conducting an investigation of the cotton worm in the South, and, taking advantage of Hubbard's Southern residence, Riley was glad to utilize the services of so good an observer and appointed him a special agent of the United States Entomological Commission. During the summer of that year Hubbard studied cotton insects in the cotton fields of Florida, Georgia, and Alabama, and many of his results were incorporated in short articles in Volume III of the "American Entomologist" and in the subsequent report of the Commission. In 1881 an investigation of the insects affecting the orange was begun by the Department of Agriculture and this work was assigned principally to Hubbard. During the next two or three years he devoted himself to this investigation. He almost immediately succeeded in producing for the first time a practical kerosene emulsion which has since become the principal standard remedy for haustellate insects. The standard kerosene soap emulsion formula is now known as the Riley-Hubbard formula. His work on orange insects was carried to a most successful conclusion and the "Report on Orange Insects," published by the United States Department of Agriculture in the spring of 1885, is founded entirely upon his original observations. Of this work so eminent a horticulturist as the late William Saunders said: "It is the best report which the Department ever published."

After the completion of this volume his attention became more and more diverted from entomology to advanced horticulture. His father's desire was to transform the Crescent City place into a model semi-tropical garden. He gradually in this work built up a most interesting place and became the horticultural oracle of central Florida. The Hubbard place became a Mecca for horticulturists and the agricultural newspapers contained many horticultural papers from his pen, but few entomological papers were published until 1892. He not only superintended all of the work on the place but took an active part in it. It was during the excavation of certain drainage canals that he contracted the disease which finally resulted in his death. In 1887 he married Miss Kate Lasier, of Detroit, and four children were born to them.

Finally, in 1889, his entomological yearnings gained control and he again visited Lake Superior, the scene of his early field

work. In 1890 he visited Montana, sparing the time from his horticultural work at Crescent City. In 1891, in company with Mr. Schwarz, he visited the Wasatch Mountains in Utah, Lake Tahoe, California, and the Yellowstone Park. In 1892 they went together to Oregon, Washington, and British Columbia. In 1893, at Crescent City, he began his most interesting, important and suggestive investigation of the insect guests of the Florida land tortoise, which, as Dr. David Sharp remarked, opened up an entirely new field of study.

In the spring of 1894 an unexpected trip to Montserrat, B. W. I., with Riley, whom he accompanied as an expert on orange insects, brought about another change in his life and his relations with the Department of Agriculture were resumed. A new and revised edition of his standard work on orange insects was greatly desired and he spent a year accumulating material for such a volume. As the work progressed, his plans expanded, and he expected to make the book include a consideration of the insects affecting all citrus plants for the entire world, but he was interrupted first by the fatal illness and final death of his father in 1896 and later by the serious failure of his own health. He was sent by his physicians in the autumn of 1896 to the south shore of Lake Superior, where it was hoped that the clear air would result in a decided improvement in his health. In the winter of the same year he went to Arizona, where he stayed till the summer of 1897. He was by that time sadly broken in health, but still explored the country more thoroughly, entomologically, than had been done before, as witnessed by the great number of insects of all orders that were collected. He returned to Detroit and seemed in somewhat better health at the meeting of the A. A. A. S., then held there. He then presented the last paper that he ever read, on the Giant Cactus and its insect fauna.

In the winter he returned to his place in Crescent City, where a change for the worse in his health took place. Accompanied by his wife, he barely managed to reach Arizona again, where he was joined by Mr. Schwarz. In spite of his greatly enfeebled condition, he still managed to do a great deal of collecting. Again returned to Detroit, he gradually failed and, to escape the inclemency of a Michigan winter, he went once more to Florida.

Here the end came and he passed away peacefully in the arms of his faithful wife.

Up to the very end his interest in entomology did not leave him. Only three days before his death, when a basket of his blue Nelumbo was brought into his room, he noticed a small moth flying about the flowers. He asked that the basket be brought to him and he collected the moth in a small cyanide bottle that he still carried in his vest pocket.

When the best efforts of contemporary entomologists were devoted to descriptive work, it was a pleasant contrast to see Mr. Hubbard's activity in that slightly cultivated field of biology in its wider sense. The best biological studies are still mostly made in insectaries and by persons professionally interested in such work. Observation of insect life in the open air requires quickness of judgment, correctness of observation and those peculiar qualities which Hubbard possessed so highly and in which he has never been surpassed.

In his entomological studies he was greatly assisted by his knowledge of botany and his intimate acquaintance with the habits of birds and animals.

Closely connected with his other observations were his achievements in economic entomology. Being an expert horticulturist and possessing a considerable knowledge of chemistry and mechanical invention, he was admirably adapted for such work. His invention of the kerosene emulsion has been already alluded to. Various improvements of the cyclone nozzle as it was then known, and other insecticide appliances are due to Mr. Hubbard, who personally experimented largely at his place at Crescent City.

Mr. Hubbard was an excellent explorer. In the investigation of a new region an explorer, as opposed to the miscellaneous collector, is able not to miss the species that are really characteristic. To do this requires not only an intimate knowledge of the order of insects to be explored but also of the hiding places and modes of life and the possession of sufficient agility and ability to get at those insects in wild or inaccessible parts of the country. Many naturalists had visited our caves; but our knowledge of their fauna was very imperfect till Mr. Hubbard's investigations. His agility and perseverance in the work were remarkable.

Another example in Mr. Hubbard's excellence as an explorer is furnished by his work on the gopher insects. This was done under the most difficult circumstances, to which those who have since tried to repeat the work have borne witness in print.

It is much to be regretted that Mr. Hubbard scattered his activity over so many fields, The result is that we have much fewer papers from his pen than his great knowledge would seem to warrant. Those that we have are written with great clearness and always to the point. He showed the same characteristics in his personal correspondence, as can be seen by his letters, some of which are now being published in these Proceedings and elsewhere. Mr. Hubbard was, on occasion, an excellent draughtsman, as shown by the admirable figures accompanying several of his papers.

Mr. Hubbard did not often appear before the public, but his speeches were always interesting and he knew how to keep the attention of his audience. His papers have been reported in the daily press, but unfortunately have not been preserved in their original form. He was a good talker, especially among a circle of entomological friends.

With all his knowledge, his transcendent ability as a naturalist, with his education and social standing, he was the simplest, most modest, most genuine, most kind-hearted of men. He was absolutely without pretension, and his death is a loss not only to his family, not only to his circle of friends and fellow-workers, not only to the world of science, but also to the world of humanity.

The following bibliography is not absolutely complete. A great many articles were published in the more fugitive press and cannot now be brought together. Neither does it include his contributions to botany or practical horticulture.

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(25) "Spread of Scale-Insects." <Forest and Stream, May 18, 1882, and Sci. Am. Supp.

(26) "Miscellaneous Notes on Orange-Insects." <Bull. 1, Div. Ent., U. S. D. A., pp. 9–13, April, 1883.

(27) "Enemies of the Scale-Insects." <Times-Democrat, August 25, 1883.

(28) "Experiments on Scale-Insects, with Practical Suggestions." <Ann. Rept. U. S. Comm. Agric., 1883, pp. 152–159.

(29) "Notes on the Habits of *Hypotrichia spissipes* Lec., with Description of the females." <Psyche, vol. IV, p. 215, figs., October, December, 1884.

(30) "Introduction and Spread of Scale-Insects." <Times-Democrat (Jacksonville, Fla.), May 10, 1884.

(31) "Rust of the Orange." <Rept. Entom., U. S. D. A., 1884, pp. 361–373, pl. I, and pl. IX, fig. 5, 1884.

(32) "Insects Affecting the Orange." <Washington, 1885, pp. 10 + 227, 14 plats, 95 figures.

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(35) "The Scale Insect." <Florida Dispatch, vol. VI, p. 34, March 29, 1886.

(36) "Insects and Foot-Rot." <Florida Dispatch, vol. V, p. 475, July 12, 1886.

(37) [*Typhlodromus.*] <Florida Dispatch, V, p. 508, July 26, 1886.

(38) "Breeding habits of *Amphicerus bicaudatus*." <Entom. Amer., vol. IV, pp. 95–96, August, 1888.

(39) "Timely War on the Scale." <Florida Dispatch, vol. II, p. 267, April 17, 1890.

(40) "Insect Life in the Hot Springs of the Yellowstone National Park." <Can. Entom., vol. XXIII, pp. 226–230, 1891.

(41) "The Inhabitants of a Fungus." <Can. Entom., vol. XXIV, pp. 250–256, October, 1892.

(42) "The Life-History of *Xenos*." <Can. Entom., vol. XXIV, pp. 257–262, October, 1892.

(43) "Notes on the Larva of *Amphizoa*." <Insect Life, vol. V, pp. 19–22, figs., September, 1892.

(44) "Description of the Larva of *Amphizoa lecontei* (plate)." <Proc. Ent. Soc. Washington, vol. II, pp. 341–346, 1892.

(45) "The Florida Land Tortoise-Gopher, *Gopherus polyphemus*." <Science, vol. XXII, pp. 57–58, August 4, 1893.

(46) "Note on *Brathinus*" <Proc. Ent. Soc. Washington, vol. III, pp. 10–13, 1894.

(47) "The Insect Guests of the Florida Land-Tortoise." <Insect Life, vol. VI, pp. 302–315, figs., May, 1894.

(48) "Insect Fertilization of an Aroid Plant." <Insect Life, vol. VII, pp. 340–345, March, 1895.

(49) [Powder-Post beetles]. <Crescent City News, April 5, 1895.

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(53) "Ambrosia once more." <Amer. Nat., vol. XXX, pp. 493–495, June, 1896.

(54) "Ambrosia Beetles." <Yearbook Dept. Agric., pp. 421–430, 1896.

(55) "The Ambrosia Beetles of the United States." <Bull. 7, N. S., Div. Ent., U. S. D. A., pp. 9–30, figs., 1897.

(56) "Observations in California, Mexico, and New Mexico." <Proc. Fla. State Hort. Soc., X, pp. 73–75, 1897.

(57) "Letters from the Southwest. The Home of *Dinapate wrightii* Horn." <Entom. News, X, pp. 83–89, April, 1899.

(58) "Habits of *Phodaga alticeps* Lec." <Proc. Ent. Soc. Washington, vol. IV, pp. 186–187, April 18, 1899.*

(59) "On *Thalassa montezumæ* Muls. (family *Coccinellidæ*)." <Proc. Ent. Soc. Washington, vol. IV, pp. 297–298, fig., April, 1899.

(60) "Insect Fauna of the Giant Cactus of Arizona; Letters from the Southwest." <Psyche, vol. VIII, May, 1899, Suppl.

(61) "Letters from the Southwest. Insect fauna in the burrows of desert rodents." <Proc. Ent. Soc. Washington, vol. IV, no. 4, pp. 361–364, 1901.

(62) "Letters from the Southwest. The Colorado Desert." <Proc. Ent. Soc. Washington, vol. IV, no. 4, pp. — —, 1901.

(63) "Letters from the Southwest. Salton Lake in the Colorado Desert, California, and its insect fauna." <Proc. Ent. Soc. Washington, vol. IV, no. 4, pp. — —, 1901.

(64) "Letters from the Southwest. Insect fauna of Dasylirion wheeleri." <Proc. Ent. Soc. Washington, vol. IV, no. 4, pp. — —, 1901.

(65) "Insect Life in Florida caves." <Proc. Ent. Soc. Washington, vol. IV, no. 4, pp. — —, 1901.

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February 2, 1899.

The 141st regular meeting was held at the residence of Dr. H. G. Dyar, 1512 Twenty-first Street N. W. Vice-President Gill in the chair, and Messrs. Benton, Ashmead, Pollard, Motter, Matthes, Dyar, Vaughan, Sanderson, Chapin, Caudell, Marlatt, and Heidemann, also present. Prof. J. B. Smith, of New Brunswick, N. J., and Mr. H. Bird, of Rye, N. Y., were also present.

Dr. E. P. Felt, of Albany, N. Y., was elected a corresponding member.

Under the heading Exhibition of specimens, Professor Smith showed typical specimens of a new species of Haploa found in New Jersey, for which he proposes the name *H. triangularis* on account of a peculiarity in the markings. Professor Smith remarked that he had a good series of this form and believed it entitled to a specific rank. Dr. Dyar said that he had been acquainted with the form for some years, but had not regarded it as a species, considering it a southern form of *H. confusa* Lyman. He also said that the species of Haploa were very local and that isolated colonies tended to be constant, which complicated the definition of the species in this genus Dr. Gill thought that forms if constant and distinguished from allied forms even by slight characters were entitled to specific rank. The subject was also discussed by Mr. Bird, and Professor Smith replied.

—Dr. Dyar showed the first volume of the Catalogue of Lepidoptera Phalænæ, being published by the British Museum, the Syntomidæ, by Sir G. F. Hampson, and remarked on the misleading title, as the volume is really a monograph of the family.

Dr. Gill gave a history of the publications of the British Museum and explained the custom which had arisen there as to the

titles of works published. He criticised the book for the omission of all references to the literature of the family name.

—Prof. Smith read a paper entitled "An Essay at the Classification of the American Noctuids." He gave considerable importance to the position of vein 5 of the hind wings as indicating the groups Trifinæ and Quadrifinæ, basing the division upon the position of the vein rather than its tendency to obolescence, which he regarded as a more secondary character. He also showed a series of phylogenies which he had prepared for the genera of several groups. Dr. Dyar took exception to Prof. Smith's idea that the Quadrifinæ were the more generalized, stating that it would be expected that the three-branched median vein represented the lower type as in the Notodontians, etc. Dr. Gill remarked that it did not follow that the highest Noctuids should necessarily have the most specialized venation. Prof. Smith briefly explained his position further. Dr. Dyar called attention to *Arsilonche albovenosa*, which has been considered to be the same as the European species. Dr. Chapman has shown in a letter recently received that the genitalia of the European form differ from those of the American form as figured by Prof. Smith, thus indicating a specific distinction as claimed by Grote. Mr. Ashmead also remarked on Prof. Smith's paper.

In the absence of Mr. Schwarz, Mr. Benton read the following letter written by Mr. Hubbard while in the southwest, in 1897.

LETTERS FROM THE SOUTHWEST.

By H. G. Hubbard.

Insect fauna in the burrows of desert rodents.

Yuma, Ar., *March 30, 1897.*

I find I have not reported my operations at Palm Springs, Cala., since March 14th. I have, in fact, not collected many things during the last week of my stay, as I was engaged in the laborious work of digging out and exploring the burrows of Spermophiles and the Kangaroo rat (*Dipodomys desertorum*). The holes of the latter baffled us entirely, and I am sure I did not succeed in reaching the true nest as I had to abandon the excavation at a

depth of 8 feet because of the treacherous dust in which we were digging. At that point the burrow, which had dwindled down to a single tunnel, was still going deeper, descending in short spirals, and although there were occasional sleeping pockets leading off from the gallery, as from those nearer to the surface, they contained nothing but a few scattered fragments of grass. A small Tineid moth (apparently not different from our common clothes moth, *Tinea bisselliella*), was, however, continually coming up out of the depth of the hole, and this seems to indicate that we might have found at last a true nest or incubation pocket lined with grass and containing insects. The upper portion of the system of galleries was simply an interminable labyrinth of holes intersecting each other, irregularly and frequently in the upper layers of soil, but deeper down in more or less well defined layers or stores a foot or two apart. We saw, of course, no sign of the rats, but their dung, which is in very small and hard pellets, was scattered about the galleries in single pieces, never in accumulations. The holes, about the size of a man's wrist, were lined with dry and extremely fine dust, in which only a wingless cricket (*Ceuthophilus* n. sp. ?) and an occasional large Tenebrionid larva appeared to live in considerable numbers. The crickets sheltered themselves in pits or small tunnels as large as the little finger, and which were excavated vertically in the roof, extending upwards from the gallery about 2 or 2½ inches. Nevertheless, I found in the upper galleries an occasional specimen of various small grey flies (*Leria pectinata* Loew, *Phorbia fuscipes* Zett. and *Ph. acra* Walk.); very rarely an Aleocharid with bright red elytra (? *Aleochara n. sp.*) which I found more commonly in the Spermophile holes; a wingless roach (*Heterogamia sp.*); a few specimens of a small Carabid (*Tetragonoderus pallidus*) and a small Silphid (*Ptomaphagus fisus*). The most interesting species is, however, a rather small black Histerid, resembling a Saprinus but having a single very slender claw on all tarsi (*nov. gen.*) and thus resembling the genus Chelioxenus. I secured only 3 or 4 specimens.

In one preliminary excavation in which the galleries were small we found also a single old and mutilated, but living, specimen of a large red Aphodius (*A. coquilletti* Linell), and a large, most remarkable Histerid, also allied to Chelioxenus, having red elytral

spots but with only the humeral striæ, and these nearly obsolete. It has also only a single tarsal claw and the front margin of the posternum is deeply emarginate (*nov. gen.*). The Tenebrionid larvæ are distinct from any I have seen before.*

The Spermophile, a very small greyish or almost white species, makes much smaller holes, although the entrances are begun in the hole of some larger mammal, so that for the first two feet it is frequently as large as that of the Florida Gopher. The Spermophile holes sometimes branch near the entrance and always turn abruptly. At a depth of 3 or 4 feet they ramify and enter a network of galleries connected with several external entrances. Frequently they are blind ends or small pockets, and sometimes in these there are large wads or nests of a peculiar soft grass which grows sparingly on the desert, or, at least in this oasis. Some, if not all, of these grass bunches are nests, as they are full of fleas and mites, and if near the surface they contain usually specimens of *Ptomaphagus fisus*. One nest we found at the termination of the deepest burrow, about 5 feet vertical depth, in a layer of very dry gravel and stones, which was composed not of grass but of a soft material like inner bark and felted into a ball with a cavity inside, evidently an incubating nest. It was also full of fleas in larva and imago, and also mites. Small bits of dung occur at random in the burrows and these attract in considerable numbers the Aleocharid with red elytra mentioned above, and more rarely a peculiar Saprinus† with rather translucent chitine and with oblique internal elytral spot. A large fly larva eats into the pellets of dung and there is also the small Tineid moth mentioned before, and a larger lepidopterous larva the imago of which I did not see. The subterranean crickets (*Ceuthophilus*) and the gray flies are very abundant and Tenebrionid larvæ not rare. In digging one of these nests we uprooted a common woody desert shrub and found in the roots an immense Cerambycid larva [*Derobrachys brevicollis*] which I still have alive. The elytra of this Cerambycid were frequently found in and about the nests or holes of the Kangaroo rat. The larva or the Saprinus mentioned above I secured in good series.

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* They have not been bred but may belong to Craniotus or Triorophus. --E. A. S.

† This is a true Saprinus but quite different from anyone in our fauna.—E. A. S.

I forgot to mention that a single specimen of a dark Apocellus Staphylinid beetle [*A. tenuicornis* Casey?] was taken March 22d in the gallery of a Kangaroo rat, and in the same hole or system of holes near the surface I found a large, dead Stenopelmatus, with the legs bitten of by the rat but otherwise not eaten. My Indian helper, Benito, a very intelligent fellow, was well acquainted with this "Idaho devil" as an enemy to their agricultural plantations. Benito and I dug four days at these burrows and I paid him $1.25 per day, so that the few insects found are valuable. I feel sure there are more things to be found in subterranean mammals' holes, but the labor and expense of unearthing them are very great. It quite tired me out.

March 2, 1899.

The 142d regular meeting was held at the residence of Mr. E. A. Schwarz, 230 New Jersey Avenue N.W. Vice-President Gill in the chair and Messrs. Ashmead, Schwarz, Motter, Pratt, Dyar, Caudell, Chapin, Vaughan, Howard, Johnson, Patten, Heidemann, Benton, Matthis, Currie, and Woods also present.

Under the head of "Short notes and exhibition of specimens," Mr. Benton stated that on January 22d he had found brood honey bees in all stages of growth and new adults, indicating egg-laying the last of December. This is a very early instance.

—Mr. Matthis exhibited specimens of what he takes to be *Boreus brumalis* Fitch, which he had caught upon the snow in the Rock Creek valley after the recent blizzard. He showed by comparison specimens of a Boreus which he had caught last October at a high elevation on the Big Horn Mountains. This was a larger and darker form than *B. brumalis* and has not been specially identified. Mr. Schwarz stated that a Western Boreus had been described by Hagen, and Mr. Ashmead stated that Fitch's types of Boreus are in the U. S. National Museum. Mr. Matthis remarked on the appearance of Boreus near Boston, and Mr. Schwarz stated that these insects are common at Cambridge, rarely being found on snow, but readily obtained by sifting moss in early spring.

—Mr. Dyar showed a blown larva of *Apatela hæsitata* Grt.,

previously undescribed. The larva nearly resembles that of *A. hamamelis* (*inclara* Sm.) ; indeed from the mature larva alone no constant differences can be pointed out, but Dr. Dyar has observed certain differences in the earlier stages of these larvæ which will be more fully worked out at the next opportunity. In this connection he also presented a list of Apatela by Prof. A. R. Grote, with generic and subgeneric types, which had been prepared by Professor Grote on request, and which is supplemental to the monograph of the genus recently published by Smith and Dyar. Dr. Dyar stated that he was pleased with Professor Grote's erection of a subgenus for *A. funeralis*, since this was definable on larval characters, as are all the other subgenera of Apatela, except Tricholonche as compared with Lepitoreuma.

LIST OF NORTH AMERICAN APATELA.

By A. Radcliffe Grote, A. M.

In this list I have arranged the species following Dr. Dyar's recent groupings of the larva, except that I retain the subgeneric names *Tricholonche* and *Lepitoreuma* as distinct. The latter was described by me in 1873 with the type *ovata;* founded upon the shape of the primaries, the contents of this group have been always homogeneous in my writings and the type and title must be retained. The neuration of the type of *Apatela* does not differ essentially from that of the type of *Agrotis.* Species of which the larvæ are known are marked with an asterisk (*).

Gen. Apatela Hübn. 1806.
Typ. A. aceris.
Subgen. *Apatela* Hübn.
= *Acronicta* Ochs. 1816.
Typ. A. leporina.
= *Megacronycta* Grote 1873.
Typ. A. americana.

* americana Harris.
aceris A. and S.
acericola Guen.
hastutifera Guen. et Walk.
obscura Hy. Edw.
* rubricoma Guenée.
* hastulifera Abb. and Sm.
hesperida J. B. Sm.

* dactylina Grote.
felina Grote.
* frigida J. B. Sm.
felina French.
pacifica J. B. Sm.
insita Walker.
canadensis J. B. Sm.
cretata J. B. Sm.
* leporina Linné.
vulpina Grote.
sancta Hy. Edw.
lepusculina Guenée.
* populi Riley.
cinderella J. B. Sm.
transversata J. B. Sm.
tota Grote.

Subgen. *Hyboma* Hübn. 1816.
Typ. A. strigosa.
= *Triaena* Hübn. 1816.
Typ. A. psi.
= *Microcœlia* Guen. 1852.
Typ. A. fragilis.

* innotata Guenée.
var. graefi Grote.[1]
* betulæ Riley.
* tritona Hübn.
* grisea Walker.
pudorata Morr.
revellata J. B. Sm.
* occidentalis G. and R.
psi Guen.
laetifica J. B. Sm.
* lobeliæ Guenée.
* furcifera Guenée.
hasta Guenée.
?*telum* Guen.
manitoba J. B. Sm.
thoracica Grote.
strigulata J. B. Sm.
quadrata Grote.
* radcliffei Harvey.
* morula G. and R.
spinigera Guenée.
harveyana Grote.
* pruni Harris.
clarescens Grote.

[1] See Riley, Bull. Ent. Soc. Brk. VIII, 3, 1884.

* superans Guenée.
* brumosa Guenée.
impleta Walk.
subochrea Grote.
* lithospila Grote.
* vinnula Grote.
paupercula Grote.
* falcula Grote.
parallela Grote.
* fragilis Guenée.[1]
spectans Walk.
minella Dyar.
mansueta J. B. Sm.
* connecta Grote.

Subgen. *Jocheaera* Hübn. 1816.
Typ. A. alni.

* funeralis G. and R.[2]

Subgen. *Tricholonche* Grote 1896.
Typ. A. afflicta.

* afflicta Grote.
persuasa Harvey.
liturata J. B. Sm.
marmorata J. B. Sm.

Subgen. *Lepitoreuma* Grote 1873.
Typ. A. ovata.

* ovata Grote.
* hamamelis Guenée.
increta Morrison.
* clarescens Guenée.
haesitata Grote.
* modica Walker.
exilis Grote.
* retardata Walker.
dissecta G. and R.
alborufa Grote.
Walkeri Andr.

Subgen. *Pharetra* Hübn. 1816.
Typ. A. auricoma.
= *Philorgyia* Grote 1896.
Typ. A. luteicoma.
= *Arctomyscis* Hübn. 1816.
Typ. A. euphorbiæ.
= *Eulonche* Grote 1873.
Typ. A. oblinita.

[1] The original reference of *Microcœlia fragilis* Guen. to Apatela is by Dyar, Journ. N. Y. Ent. Soc. March, 1898, 41.

[2] Dr. Dyar states that the larva of *funeralis* is a probably important exception to the classification of Prof. J. B. Smith.

illita J. B. Sm.
*luteicoma G. and R.
*sperata Grote.
*noctivaga Grote.
emaculata J. B. Sm.
*impressa Walker.
fasciata Walk.
verrilli G. and R.
brumosa Morr.
*distans Grote.
barnesi J. B. Sm.
perdita Grote.
edolata Grote.
*Hyliniformis Guenée.[1]
?*longa* Guen.
var. pallidicoma Grote.
*oblinita Abbot and Smith.
salicis Harris.
*lanceolaria Grote.
insolita Grote.

Gen. MEROLONCHE Grote 1883.
Typ. M. spinea.

spinea Grote.
lupini Grote.
ursina J. B. Sm.

Gen. *Apharetra* nom. nov.
Typ. A. dentata.

dentata Grote.
pyralis J. B. Sm.

—Mr. Schwarz exhibited some very dry and hard pulp of the giant cactus, taken by Mr. Hubbard in the winter of 1897, and containing specimens of the extraordinary Scolytid, *Cactopinus hubbardi* Schwarz. He had examined this pulp in January, 1898, and found the beetles alive, with no indication of oviposition. He moistened it somewhat at that time and showed the same

[1] It is a mistake to suppose that I ever determined this species as *spinigera.* For a moment I thought the form *pallidicoma* might be Guenée's *spinigera* and communicated this to Dr. Thaxter. I determined *Hyliniformis* for Prof. Riley, in the sixties, for his report. The *Hyliniformis* of my lists and collections accords with the species so named by Prof. J. B. Smith.

beetles still alive, thus indicating that they may live in the adult condition for two years.

—Mr. Howard showed a remarkably clear and beautiful photograph of *Phasgonophora sulcata* Westwood, which had been taken by Mr. M. V. Slingerland, and spoke briefly of the advantage of photography in entomological illustration, expressing the opinion that a fair photograph reproduced by the half-tone process is in many instances better than a poor drawing, but that the best photographs he had seen reproduced in this way were by no means equal to drawings made by competent artists. Such a photograph as the one exhibited, however, marks a great advance on previous efforts of the kind, and would be invaluable at least as an aid to the artist, and if transferred by photography to a wood block, and then handled by a competent wood engraver, would obviate all necessity for drawing and would produce the most satisfactory results which could be obtained, since the slight failures in details could be easily rectified by the engraver.

Some discussion on the possible utility of the enormously enlarged and modified hind femora of *Phasgonophora sulcata* ensued, Messrs. Gill, Schwarz, Ashmead, Howard, and Pratt taking part. Several possibilities were suggested, but no probabilities. It was shown that far from being of service to the insect in leaping, as are the enlarged hind thighs of Halticid beetles, in Phasgonophora and allied forms the big thighs are a detriment. The Chalcidoids which leap the best have thin legs. Mr. Ashmead showed the occurrence of enlarged hind thighs in more or less isolated groups throughout all of the parasitic Hymenoptera, and even in one instance among the Cynipidæ, as shown by specimens collected by Currie in Liberia. Dr. Howard remarked that the peculiar structure was obviously not of service in copulation, since it occurs in both sexes, upon which Dr. Gill said that sexual characters of the same nature are not necessarily confined to a single sex, instancing the presence of mammæ in male Mammalia and their occasional functioning. Mr. Schwarz said that similar femoral structures had been observed by Zimmermann to be of use in enabling beetles of the genus Tachygonus to grasp the edge of leaves in alighting. Dr. Howard, however, who had studied *Chalcis flavipes* when flying, alighting, and ovipositing, had observed no function of the thighs in any one of these three processes.

—Dr. Gill mentioned the resemblance of certain coleopterous larvæ to certain Trilobites, especially among the Staphylinidæ. He said he had been struck by this resemblance in a figure of a Silpha larva, even the antennæ resembling the antennæ of Trilobites as recently discovered by Beecher. He mentioned the figure of Fluvicola, mistaken for an Isopod crustacean, in De Kay's volume on the "Crustacea of New York," and Le Conte's conclusion that it was the larva of Psephenus, and asked for further information as to this resemblance.

Mr. Schwarz said that this wonderful resemblance extends through several families of coleopterous larvæ. He instanced Micropeplus among the Staphylinidæ, various genera of Endomychidæ, groups of species in the old genus Silpha, Psephenus, and Helichus among the Parnidæ, and various genera of the Dascyllidæ and Lampyridæ. The resemblance is largely caused by the exfoliation of the sides of the body. What its function is he did not know, some of the larvæ possessing it being aquatic, some subaquatic, and some terrestrial

Dr. Howard jocularly suggested that certain naturalists might consider it to be a case of protective mimicry, since fossil Trilobites are obviously protected from the attacks of birds.

The first paper of the evening, by Dr. Dyar, was entitled:

ON THE FLUCTUATIONS OF THE POST-SPIRACULAR TUBERCLE IN NOCTUID LARVÆ.

By Harrison G. Dyar.

At the last meeting of this Society, Prof. J. B. Smith presented a paper giving a classification of the Noctuidæ, in which he recognized a number of tribes based on imaginal characters. While it is true that the larvæ of these moths are very uniform and do not present any marked structural differences, I have been attracted by the variations in the position of tubercle iv, or the post-spiracular tubercle, both in different species and on the different segments of the same larva, and I propose to trace out some of the characters of the movement of this tubercle in connection with Prof. Smith's classification.

In the more generalized Lepidopterous larvæ, tubercle iv is situated well below the spiracle, in line with tubercle v. All the Noctuidæ have departed from this condition, and are characterized by having tubercle iv moved up more or less behind the spiracle

above the line of tubercle v. It is evident that the more this tubercle is moved up the greater is the departure from the primitive condition, and hence the greater the specialization. In the Noctuids there is a considerable range of position, varying from a position below the spiracle near tubercle v to one above it, near tubercle iii. It appears, however, on going over a number of species, that the exact position is a fluctuating one. None of the groups as defined by Prof. Smith are absolutely constant, several generalized larvæ appearing in nearly every otherwise specialized group and specialized larvæ occasionally appearing in the generalized groups, so that the character is not of fixed importance. However, an average of the species of a group shows the general tendency of that group and compares very interestingly with Prof. Smith's results, as I will show. First, to refer to some of the details of arrangement.

I have mentioned that tubercle iv is not the same on the several segments of the same larva. The differences follow a general rule. Considering the eight abdominal segments with spiracles, on the first segment iv is generally a little higher than on the rest; on the second, usually lower; on the third to sixth, usually higher, gradually more and more so posteriorly, till on the sixth segment it is often the highest of all; on the seventh segment, suddenly lower, often very markedly so, the difference becoming more pronounced in highly specialized larvæ where this tubercle seems even to recede while the others advance, so that it may, at the extreme, fuse with tubercle v. On the eighth segment iv is moderate or low, somewhat as on segment 2. The generalized condition of tubercle iv on the seventh abdominal segment (joint 11) is specially interesting in connection with Dr. Chapman's discussion of this segment in Acronycta larvæ, since it shows that his "weak segment" is not confined to this group, but extends throughout the Noctuids. Indeed, it extends through the Notodontians as well. A few species have specialized this segment, as much so as the others; I have seen two or three cases, but in one at least of them I can trace a definite cause. I shall refer to this elsewhere. (*Hydrœcia purpurifascia.*)

I stated above that the Noctuid larvæ do not present marked structural characters. To this the Acronyctæ and Pantheids are exceptions, as they possess variously modified many-haired tubercles or warts. It will be remembered that we have generally associated these groups as possessing this larval character in common, though Prof. Smith's classification separates them rather widely. It is therefore interesting to note that on the character of tubercle iv they are not closely allied, the Acronyctini being all highly specialized, while the Pantheinæ contain a large proportion of very generalized species and have none that resemble the Acronyctids in the fusion of tubercles iv and v on the seventh

abdominal segment. This would seem to prove that wart formation has taken place twice independently in the Noctuidæ, and it agrees with the indication of the moth structure.

It will be remembered that Prof. Smith began his phylogenetic tree with the Erebiini and Homopyralini as one branch, which terminates, and the Poaphilini, Catocalini, and Phoberini as a second branch. All these have generalized larvæ without exception, so far as my material goes, though in a few species of Catocalini and Phoberini, the terminal twigs, a slight tendency toward specialization shows in that tubercle iv on the sixth abdominal segment has risen as high as the middle of the spiracle. The Phoberini give rise to the rest of the groups in two main stems. The first throws off the Eucalypterini and Cillini, of which I only know one larva, which shows partial specialization, being intermediate. Next the Acontiini and Erastriini; of these I have five larvæ, two generalized, one intermediate, and two specialized. Finally the branch ends in the Anomiini, Plusiini, Stirriini, Eudryini, and Heliothini. All of these have generalized larvæ except the terminal Heliothini, which are specialized, though not very strongly so. The other main stem from the Phoberiini gives two branches, the Orthosiids and Hadenids. The Orthosiids branch into the Mamestrini, of which I have 19 larvæ, 16 specialized, 3 generalized; the Orthosiini, 8 specialized, 1 generalized; the Xylini, 5 generalized, 3 specialized. The Orthosiini give rise again to the Cosmiini and Noctuini, of which I have 27 larvæ, three only being generalized. The Orthosiids are thus decidedly specialized with the exception of the Xylinini. This group is given by Prof. Smith as a side branch from near the base of the main stem. The Hadenids branch into the Caradrini with three generalized, one intermediate, and two specialized species, and the Hadenini with three generalized and ten specialized species before me, as one furcate branch. The other branch gives in succession the Bryophilini and Acronyctini all fully specialized, without exception, in my material.

Thus we see a generally advancing tendency for the majority of the species to become specialized as we advance up Prof. Smith's phylogenetic tree, and in no case do the larvæ essentially contradict Prof. Smith's results.

The following list will show just which genera and how many species in each have been examined in the larva. G for generalized, S for specialized.

Erebiini.
Eubolina, 1, G.
Pheocyma, 1, G.
Homoptera, 1, G.
Ypsia, 1, G.
Homopyralini.
Spargaloma, 1, G.
Poaphilini.
Catocalini.
Catocala, 4, G.
Euclidia, 1, G.
Drasteria, 1, G.
Phoberiini.
Panopoda, 1, G.
Harveya, 1, G.
Parallelia, 1, G.
Hypsoropha, 1, G.
Phoberia, 1, G.
Eucalypterini.
Scolecocampa, 1, Int.
Cillini.
Acontiini.
Exyra, 1, G.
Chamyris, 1, G.
Acontia, 2, S.
Erastrini.
Thalpochares, 1, Int
Anomiini.
Aletia, 1, G.
Anomis, 1, G.
Plusiini.
Plusia, 2, G.
Ogdoconta, 1, G.
Plusiodonta, 1, G.
Ingura, 1. G.
Calpe, 1, G.
Heliothini.
Heliothis, 1, S.
Alaria, 1, S.
Stiriini.
Eudryini.
Eudryas, 3 G.
Copidryas, 1, G.
Bryophilini.
Bryophila 4 (Eur.), S.
Acronyctini.
Acronycta, 27, S.
Arsilonche, 1, S.
Harrisimemna, 1. S.
Hadenini.
Macronoctua, 1, S.
Hyppa, 1. G.
Homohadena, 1, S.
Oligia, 1, S.
Hadena, 2, 1S 1G.
Feralia, 1, S.
Pyrophila, 1, G.
Caradrinini.
Catabena, 1, G.
Caradrina, 2, S.
Crambodes, 1, G.
Laphygma, 1, Int.
Prodenia, 1, G.
Xylinini.
Xylina, 2, 1S 1G.
Scopelosoma, 2, 1S 1G.
Glaea, 2, 1S 1G.
Calocampa, 1, G.
Cucullia, 1, G.
Orthosiini.
Orthosia, 2, S.
Trigonophora, 1, S.
Hydrœcia, 2, S.
Nonagria, 1, S.
Bellura, 1, G-modified.
Jodia, 1, S.
Achatodes, 1, S.
Noctuini.
Agrotis (sens. lat.), 26 3G, 23S.
Ufeus, 1, S.
Cosmiini.
Mamestrini.
Morrisonia, 1, S.
Taeniocampa, 2, S.
Eupsephopæctes, 1, S.
Nephelodes, 1, G.
Orthodes, 1, S.
Leucania, 1, S.
Xylomiges, 2, S.
Mamestra, 10, 8S 2G.

—The second paper included a continuation of Mr. Hubbard's letters from the Southwest. Mr. Schwarz, in presenting these letters, said that although the first of them did not contain any entomological matter, he had no hesitation in recommending its publication in the PROCEEDINGS on account of the fascinating way in which the author had depicted his impressions while transversing this interesting and little-known region of the Southwest.

LETTERS FROM THE SOUTHWEST.

The Colorado Desert.

By H. G. Hubbard.

San Diego, Cala., *February 1, 1879.*

I must not close this letter without describing my journey across the State of California from the Colorado river of Arizona to the sea. On leaving Yuma we turn down stream and run for seven miles in the bottom lands back from the river. At El Rio, the old stage line crossing of the river, there is now but a sign-post rising in solitary loneliness from the untrodden sands of the desert, but the distant river bank is marked by a line of old grey cottonwood trees, which, doubtless, still rear underneath their bark *Eleusis fasciata* and the numerous other Coleoptara of Dr. LeConte's collecting in 1850.

At this point the railroad climbs up from the river bottom onto the desolate sandy plain and heads westward towards the sea. A great isolated dome of barren rocks marks this point around which the river turns away southward in its course to the gulf. Here begins a broad and level avenue between two lines of hills which rise gradually into snow-clad mountains, and on this course the iron rails of the Southern Pacific stretch west by north, with hardly a perceptible curve to right or left, and with not a single cut through sand hill or rock, across the rolls of the continent to the summit of the pass over the Sierra Nevada Mountains.

At first we rise over a wave of sand 50 miles in width. The vegetation consists of scanty and stunted shrubs; on the north, extending to the foot of absolutely barren and sunbaked rocks, and on the south, disappearing altogether in an endless succession of white sand hills, drifted like the waves of the sea. More and more desolate becomes the country as we descend into the region beneath the level of the sea. At Mammoth Tanks the train stops a moment to drop a cake of ice before the door of a solitary cottage, neat and trim in a fresh coat of brown paint, but resting on the bare sands besides the track, with not a green leaf in sight for miles around. A little garden ground, laid out with white stones instead of plants, has the cynical notice to "keep off the grass!" The sun of an August noon beats down upon the unshaded soil, but underneath the shadow of the veranda of the dwelling stands a young girl, fresh and cool in her white muslin dress, like a summer girl at Newport. Against the wall of the building by her side rests a bicycle resplendent in polished metal, and near at hand a wonderful figure of a slim athletic man in knickerbockers and red shirt, decorated with many medals and with a huge revolver slung in a leather bolster at his hip. We did not delay to

inquire the meaning of this apparition in the midst of the burning desert sands, but plunged onward and downward into the frying pan of the continent, 263 feet beneath the ocean level.

Away to the south, a glimmering line of water begins to appear, which keeps even pace with us, mile on mile, but grows ever broader and more distinct, until, finally, there stand out, upon its surface, rocky islets and promontories, and the white sandbanks of the distant shore are reflected from it as in a mirror. At Volcano Springs, a railroad section station, with two or three rambling buildings, built mostly of railroad ties, the plain slopes away to the south, a bald sheet of dead clay, like the dried-up bottom of a horsepond in midsummer. Its surface is seamed and streaked with trickling channels of some long forgotten flood, all winding down to meet the line of glistening water.

It was here the passengers, crowding out onto the platform of the cars, inquired of one of the inhabitants the name of this long and narrow lake which had accompanied us so many miles, and were told, although not one of us believed the tale, there was no water there, but only a mirage of the trembling air on the sun-dried mud. It could not be credited, for looking backward with our own eyes we saw the rippling waves break upon the shores, and the shallow waters growing ever broader as they receded, opening at last between bold rocky headlands into an estuary of a limitless sea, blue as the bay of Naples. But whether a phantom sea or lake of brine, we rolled along its shores some miles further, getting deeper into summer and longing for panama hats, and the brown mud becoming at first heavy and then white as snow, until, at Salton, everything seemed floating in the air, and huge buildings, emitting puffs of steam from every pore, stood resting lightly on the surface of the water, and locomotives with trains of loaded cars came floating inwards bringing salt to add to the snowy piles that lined our track.

On getting underway again we soon crossed over the valley, heading the lake or mirage, whichever it may be, and sped along over plains white with salt and under the shadow of lofty mountains crowned with black storm clouds and dusted with snow. Soon we rolled into the cool shade of the palms that cluster about the hotel at Indio, where water, brought down in pipes from the San Bernardino Mountains, makes a green oasis of grass and verdure. Here we had a dinner long to be remembered. Afterwards we began the long climb up the slope of the sierra. Sand dunes, with half-buried thickets of desert vegetation, gradually gave way to rocks and cacti with clumps of Yuccas. At last a little station, marked Palm Springs upon its front, was reached, and here a narrow iron track led northwards into some hollow of the mountain, where they say lies hidden an oasis of hotels and palm trees. Soon after leaving this point, the storm in the mountains

burst upon us in the valley, and rain with blasts of wind obscured the scenery.

I went to sleep for awhile, and when I awoke, behold the earth had grown green with grass. A refreshing coolness succeeded the hot breath of the desert. The mountains came closer and the valley rose between them, and cultivated fields of alfalfa began to appear. Finally, groves of red-limbed fruit trees, with shining threads of irrigation waters, lined our way, and at sunset the cows came trooping home to the farm yards wading knee deep in clover. This was the end of the desert and the summit of the divide at Beaumont. Thence we whirled downwards in the darkness, passing towns innumerable, with junctions to Pasadena, Redlands, Pomona, and many others, well remembered names. At last we saw the twinkling lights of a great city, and the various stations of Los Angeles were called.

LETTERS FROM THE SOUTHWEST.

Salton Lake in the Colorado Desert and Its Insect Fauna.

By H. G. Hubbard.

Yuma, Ariz., *March 30, 1897*.

In regard to what you say of the insects collected by me in the desert washes at Palm Springs, that the California desert was once an arm of the California gulf, you are surely mistaken. The shells found in all this region are all fresh-water remains ; and the marine shells are found only to the south of the divide which bounds the Salton Sea. The desert sands bordering this depression are white with small shells, but they are all of the usual fresh-water forms. I have preserved a few of the smaller and most abundant forms. I believe even from my short visit to Salton that I have got the essential character of the fauna. It contains absolutely no marine forms and none at all modified by the peculiar environment, except, perhaps, the brine fly (Ephydra), which is quite different from the species inhabiting the Great Salt Lake of Utah. There is no Brine Shrimp (*Artemia*) in any of the saline springs, and it is very evident that the origin of the saline deposit is quite recent and even now in process of formation from the numerous saline springs which surround the basin both on the north and south. At the surface these springs contain only from 1 to 6 per cent. of solid saline matter, but at a depth of one or two feet the brine has a density or 27 per cent., consisting of both chloride of sodium and sulphate of soda (Glauber's salt). At no very remote period this basin was filled with fresh water, but neither this nor any other part of the Colorado desert north of the San Jacinto range was ever marine.

The Salton Sea or Lake is one of the greatest natural wonders of the world. It is a shallow deposit, only one or two feet in depth, of *solid* saline matter and is 8 miles wide and 20 miles long, surrounded by saline springs which build up mounds and cones of saline matter and matted roots of cane grass, back of which is the ordinary desert vegetation, gradually disappearing as it descends from the level of 260 feet to about 265 feet, at which point only one plant flourishes, and this plant is the only peculiar saline plant, outside of the grasses, to be found in the basin as far as I know. This plant is *Allenrolfea occidentalis*, and I mail you herewith a few sticks which contain larvæ of a Ptinid beetle[1] and also a Clerid enemy and perhaps some other things. It yields at last to the solid indurated crust of salt and soda which becomes finally an unbroken plain of pure salt, the lowest depression being 280 feet below sea level at four miles from the edge of the salt plain. Here the soda sinks below and forms a layer about a foot thick and solid as a rock. Above this is a layer of black mud and then a surface layer of pure salt from a foot to 18 inches in thickness. The surface of the salt is dry and hard, resembling ice and glistening in the tropical sun with the million scintillations of a polar ice floe; white, harder and smoother than a sheet of snow.

I reached Salton late on Saturday (March 28). Sunday was a fine day and I devoted the morning to an examination of the salt springs and the fauna of the basin. The line of debris from the great overflow of the waters of the Colorado River in 1891 was plainly visible upon the surface of the salt near the shores. But every stick and floated railroad tie was solidly fastened down and only a few spiders lurked under the fragment, evidently living upon insects blown out upon the salt plain.

Far back from the margin of the lake the earth is stiffened with saline matter, and the feet break through as in walking over cultivated fields on frosty mornings in spring. Here there is no vegetation except the Allenrolfea bush growing upon small mounds, and the grass about the salt springs, but even this last is encumbered and encrusted with snowy incrustations. There is little chance for insect life because of these thick incrustations, which bind down and solidify every particle of soil and wood, but on the mounds and about the roots of the Allenrolfea beneath the thin crust is a dry and dusty soil, largely consisting of pulverized saline matter, and here are a few Hemiptera and spiders; and in the larger stems of the Allenrolfea I found the larvæ mentioned before. Where the springs break forth in larger volume and form small flowing streamlets there are patches of grass encrusted with mineral matter, and even the mud along these rivulets is

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[1] The Ptinid beetle was successfuly bred at Washington and proves to be *Ctenobium cinereum* Horn, originally described from southwestern Texas. The Clerid larva has not been bred.—E. A. S.

bordered with ice-like crystals and crusts. Where these enter the water, when turned over they are lined with green algæ and upon these there is in vast numbers a small Hydrophilid (*Creniphilus* n. sp.) with pale elytral tip, and in almost equal number, in the mud beneath, a pale Philhydrus (*Ph. diffusus* Lec.) of large size, and less commonly two species of Ochthebius (*O. rectus* Lec., and *n. sp.*). In the surface of the slimy pools is common a salt fly, evidently an Ephydra, of bronze color, its pupa to be found in the rust-colored mud and algæ under the water. A few insignificant looking Staphylinidæ (*Homalota* and *Trogophlœus*) are to be found in the salt-grass around the edges of flowing springs; there is also *Actobius pæderoides* Lec. a small Dyschirius (*D. integer*) and some semiaquatic Hemiptera (Salda) in the pupa stage. There is finally a small black Tachys (*Tachys corax*) running commonly about on the salt mud.

Around some of these springy places are large clumps of a very tall cane grass, which form mounds several feet in height. These are too dense and matted to enter usually, but sometimes, where the mounds are abrupt and not too wet, there is a hard crust of saline soil, under which is a moist and even pasty mass of rotten grass in which two species of ants have formed extensive colonies. One of these is a small red species (*Cremastogaster* sp.), the other a very large pellucid, honey-yellow form (*Camponotus fragilis*), and always in, under, or about these colonies are found specimens, in considerable numbers, of two species of the Carabid genus Thalpius (*Th. dorsalis*, Lec., *hornii* Chd.). I do not suppose that these beetles are so much myrmecophilous as they are attracted by the honey dew of a Homopteron which occurs in large colonies among the ants. The mature insect of this Homopteron is grey, with thin broad wings, and the young with wide flaring caudal tufts of wax.

I have very few other insects from Salton, but I saw many fragments of a summer fauna preserved in the salt crust, and among them there is *Cicindela hæmorrhagica*, which certainly belongs to the saline fauna.

The saline fauna of Salton seems to be very poor; in fact, there is too much salt here, and I did not find any of the Great Salt Lake species. Moreover, the investigation of this fauna is very difficult because everything is cemented solidly by salt and soda sulphate.

Some discussion ensued on the question as to whether the Colorado desert had been occupied at any modern period by an arm of the sea, Messrs. Vaughan, Schwarz, and Gill taking part.

—As the time for adjournment had not quite been reached at

the conclusion of this discussion, Mr. Schwarz referred briefly to the reasons why he and Mr. Hubbard during the early summer of 1898 had not succeeded in securing specimens of *Thalassa montezumæ*, a Coccinellid which, in southern Arizona, preys upon a Lecanium scale on mesquit, for transmission to southern California for possible use against the black scale (*Lecanium oleæ*). Only a few weak colonies of *Toumeyella mirabilis* were seen in 1898, and only a single specimen of Thalassa was accidentally found in the Santa Rita Mts.

Dr. Howard briefly explained the desirability of this practical attempt at handling a predatory species, showing that the black scale is well kept in check by *Rhizobius ventralis* in the olive groves of southern California, which lie near the sea-coast in a more or less humid climate, but that a similar enemy of the scale is needed in more arid regions further inland.

April 18, 1899.

The 143d regular meeting was held at the residence of Mr. L. O. Howard, 1336 30th street N. W. Vice-President Dyar in the chair, and Messrs. Benton, Busck, Gill, Pollard, Ashmead, Schwarz, Judd, Sanderson, Chapin, Caudell, Morris, Motter, Matthis, Wilcox, Cockerell, and Howard also present.

Under the head of Exhibition of Specimens and Short Notes, Mr. Howard exhibited a vial full of specimens of a species of Peripatus just received from some unknown correspondent in Trinidad.

—Mr. Schwarz exhibited fragments of a large Scarabæid beetle belonging to the genus Chrysina. These fragments were found quite plentifully among decayed leaves by Mr. Hubbard and himself in Madera Canyon, Sta. Rita Mts., southern Arizona, at an altitude of about 6,000 feet. At the proper season, probably in August, the perfect beetle cannot be rare in this locality. The species has been determined by him as *Chrysina beckeri* Bates, the determination being somewhat doubtful but probably correct. At any rate the genus Chrysina, which is allied to Pelidnota and Plusiotis, should be included in the fauna of Arizona. The insect is probably a grape feeder in the imago state.

—Dr. Dyar showed specimens of *Megalopyge krugii* Dew., collected by Mr. Busck in Porto Rico. The larva was described by Dewitz in his original communication, but so briefly that the following additional points may be noted. The shape is as in *M. crispata* and the structure of the feet the same. The skin of the mature larva is almost without pigment, only a faint broad blackish dorsal band persisting on joints 3 to 7. It is nearly covered by the tufts of hair, which are white. The hair is appressed and directed backward as in *M. crispata*, except that in front, on joint 3, there is a longer erect tuft mixed with black hair and posteriorly the dorsal hairs of joint 13 are elongated and form a terminal tuft directed horizontally. The dorsal warts (I–II) are elongated, their hairs meeting so as to leave no bare dorsal space. The lateral warts (III) are of good size, the subventral ones (IV–V) small, while below these are the very small and rudimentary hair tufts representing tubercles VI and VII. The post spiracular eversible glands are present as in *M. crispata*. Young larvæ were also collected by Mr. Busck. In these the hair is much thinner, being finer, longer, and less tufted, and more mixed with black, especially at the extremities. Besides the anterior erect dorsal tuft there are a pair of smaller subdorsal tufts composed of a few black hairs, and a few hairs between these. There is a broad dorsal band of black pigment running the whole length, nearly enclosing the dorsal warts. On joints 3–5 this band is reddish centrally, but posteriorly the white dorsal hairs meet centrally, forming a diffuse crest. The warts bear a number of short, spiny hairs (doubtless poisonous) besides the long soft white hairs. The larvæ were collected on mangrove.

Mr. Howard asked whether Mr. Busck had been stung by this larva, and Mr. Busck replied that the first one which he found had fallen on the back of his hand and produced severe pain and inflammation which lasted for three days.

—The first paper of the evening was read by Mr. Schwarz and consisted of a continuation of the Hubbard correspondence from the Southwest.

LETTERS FROM THE SOUTHWEST.

Insect fauna of Dasylirion wheeleri.

By H. G. HUBBARD.

HOOKER'S HOT SPRINGS,
GALIURO MTS., AR., *May 25, 1897.*

The ridges in this vicinity are populated by numerous clumps of *Dasylirion wheeleri*, many of them killed by the cattle, which constantly eat out the buds. The young and vigorous plants do not seem to be infested by insects, but the dead and dying plants are inhabited by a fauna as interesting as that of the Giant Cactus, and among them I recognize a few species as identical, for instance some of the small Histeridæ and one of the Hololeptas (*H. vicina*), which are extremely abundant in Dasylirion; I find also *Trimium puncticolle*, *Eumicrus lucanus*, *Ditoma gracilis*, and *Holoparamecus pacificus*. The numerous Staphylinid beetles of the Dasylirion fauna are, however, wholly different from those of the fermenting mass of *Cereus giganteus*, and belong mostly to the more deplanate forms of the subfamilies Aleocharinæ, Pæderinæ, and Piestinæ. The large *Belonuchus ephippiatus* of the Giant Cactus is represented in Dasylirion by another species (*B. xanthomelas*), which, however, I find also in decomposing Yucca and Agave. The large Dipterous (Volucella) larvæ and the Staphylinidæ of the genus Maseochara as well as the Hydrophilidæ are here wanting, but there are in Dasylirion numerous other species of insects, almost all of them Coleoptera and of small size.

All these insects live between the broad, flat, imbricated, and closely applied leaf bases of this most singularly constructed plant, and are dependant upon the disorganization effected by a large Calandrid beetle (*Scyphophorus acupunctatus*), and, more rarely, allied species (*Yuccaborus frontalis*). These beetles usually enter the inside of the plant alongside the buds that start between the leaf bases from the central axis.

Into the holes made by these Calandrids the Hololepta and Belonuchus push their way, and they are accompanied by the smaller Histerids (*Epierus planulatus*, *Paromalus opuntiæ*, *P. gilensis*, *P. tenellus*), the smaller Staphylinidæ, several Tenebrionidæ (*Aphanotus parallelus*, *Ulosonia marginata*), and finally a very peculiar beetle, which is no doubt an undescribed Othnius. The small Staphylinidæ of this fauna are very interesting; the commonest is a Piestid, a veritable beauty (*Piestus extimus* Sharp). It runs actively about and sweeps its long antennæ from side to side like a Læmophlœus. Next in interest is a small slow-moving Pæderid (*Leptogenius* n. sp.), its body being dark umber-brown, velvety and opaque, with dull-red head and legs. A few

specimens of *Eleusis fasciata* also inhabit the fermenting Dasylirion leaves. Finally there are several Aleocharinæ, all more or less flattened, opaque, with dark coloration, the elytra alone being reddish. Of other orders I find the jumping larva of a Piophila, a peculiar Phlœotrips and the larva of a small Lepidopter.

Without a careful and methodical dissection of the plant hardly anything of this rich fauna can be found. The bud and the bud leaves must first be removed, and then the leaves surrounding the central axis of the plant lifted out one by one in their regular order, beginning with the uppermost layer of leaves. It takes several hours to thoroughly examine a large plant, but not a single insect living between the imbricated layers of leaves can make its escape from the bowl-shaped cavity between the handles of the leaves and the central axis.

In the lower layers of leaves, near the ground, a number of other beetles creep in from beneath but do not properly belong to the Dasylirion fauna: various Tenebrionidæ (*Arœoschizus decipiens*, *A. sulcicollis*, *Emmenastus longulus*), Hemiptychus, Elaterid larvæ, etc. Underneath the dry clumps of dead Dasylirions which can be overturned, there are the usual rats' and mice nests and usually a numerous colony of Eleodes.

In the dead flower stalks I see the burrows of a Buprestid, probably Thrincopyge, but flower stalks are rare here, as they are generally eaten off while young and tender. One of the poles of last year, however, had a large colony of *Apotrepus densicollis*, most of the specimens being immature. The flowers of Dasylirion attract great numbers of a Chrysomelid (*Triarius trivittatus*) and small Mordellid beetles (*Pentaria decolorata*).

I forgot to mention that I find constantly in the central axis of dead Dasylirions a large lamellicorn larva (*Phileurus illatus*). It is this larva which reduces to powder the axis of the dead plant, following up the work of Scyphophorus, which feeds for the most part in the leaf bases, seldom burrowing deeply in the central core, and never attacks the dry and dead plants. The Phileurus larvæ reduce the core which binds together the disk-like whorls of leaf bases, so that the entire plant can be overturned and disintegrated by a few kicks with the foot. The larva is forming its pupa cell in the rotten heart of the plant; the pupa has a pair of stout horn-like elevations upon the head, and is dark red in color; in fact, it resembles very much that of Xyloryctes. It is difficult to preserve the living pupa without injury in spite of its apparently solid construction. There is apparently another large white grub in the older stems after they have been partly eaten out by the Phileurus. I have not found the pupa of this, but it may belong to Listrochelus or Phytalus. A Longicorn larva of rather peculiar appearance (perhaps *Tragidion armatum*) bores into and through the dying leaf bases of Dasylirion and forms pupa cells which resemble those of Scyphophorus.

This communication was briefly discussed by Messrs. Pollard, Cockerell, Ashmead, and Schwarz. Mr. Pollard asked whether the agave and other large plants of that region have similar insect fauna. Mr. Schwarz replied that there are in Mr. Hubbard's letters various scattered observations and notes on the insects living in or on Yucca, Agave and Nolina which he expects to gather and present at a future time. *Agave palmeri* seems to be the only Amaryllidaceous plant of southern Arizona which when perfectly healthy is attacked by insect borers. These are two species of the Curculionid genus Zygops and a lepidopterous larva of the genus Megathymus.

Mr. Cockerell stated that two Coccids had been found upon the Dasylirion, but that both species were also found upon yuccas. Mr. Ashmead said that the Dasylirion insects were very similar in characters to the insects found in decomposing palmetto in Florida.

—The next paper was by Mr. Marlatt, and in the absence of the author was read by Mr. Benton. It was entitled:

REMARKS ON SOME RECENT WORK ON COCCIDÆ.

By C. L. Marlatt.

No group of insects has excited more interest, nor attracted more new students perhaps in the last few years, than the scale insects, or Coccidæ. Entomological magazines, and, in fact, journals of all sorts and descriptions, and in the most unexpected and unusual quarters, have been heavily charged with literature of new species, sub-species, etc. The great number of such new species has struck the attention of non-workers in this group, and particularly has the designation of an astonishing percentage of sub-species, physiological species, varieties, etc., been calculated to arouse the gravest suspicion as to the reliability of the work done and the validity of the forms characterized, especially when the characters on which the new species, sub-species, etc., are based are at all carefully investigated. That with all the enthusiasm manifested in working up new material and describing new forms many good species are found and characterized cannot be doubted, and it is therefore the more to be regretted that the authors responsible for much good work have been led by a surplus of zeal to be guilty also of much that must be a positive detriment to the knowledge of this group of insects. For the benefit of future students, and with the intention merely to bring about, if possible, a much needed reform in the interest of the

scientific value of the work done, it may not be out of place to call attention to some of the common sources of error and questionable work. The criticisms to follow apply more particularly to the scale insects belonging to the Diaspinæ, with which the writer is most familiar, and especially to the genus Aspidiotus in its old and broader sense.

In the first place, it does not seem to have been sufficiently impressed on some writers that the scale covering, though an important adjunct of the insect, is not the insect itself, and still less the extraneous matter, such as sooty mold, epidermis of bark or leaf, etc., with which the scale may be covered. Many of the Diaspinæ, in fact almost any of them, at times may assume a slight or marked so-called "mining" habit. In other words, the female insect in revolving from side to side in the formation of the covering scale, and in making additions to it, is very apt with her flat chitinous lobes to cut under the superficial and more or less loosened layers of the bark with its covering of mold or other extraneous matter, and this loosened material slides up over the scale and adheres closely to it, much modifying and changing its color and appearance. This mining habit varies, of course, with the plant, being less on perfectly smooth bark, and much more prominent on bark that is rough or fibrous, or on older wood. The same mining habit is exhibited in scales occurring on leaves where the epidermal growth or any sooty mold, or other foreign matter, is lifted and covers the scale in the same way. Several species or sub-species of scale insect have been established on accidental variations of this character, as, for example, *Chionaspis furfurus* var. *fulvus* King. Examples of the type of this species sent to the Department of Agriculture exhibit many scales which show none of the epidermal coverings, while others, owing to the character of the adjacent bark, are covered more or less completely by the outer layer of the bark of the plant. On this basis any scale insect almost may be split up into two or three species or varieties. The careful study of the scale in its relation to its situation on bark or leaf made by the writer has shown that the majority of the species in the Diaspinæ occasionally or frequently present epidermal or extraneous coverings.

The scale varies also in shape, as influenced by the nature of its surrounding conditions. The exuviæ are often shifted, or apparently so, by obstructions, such as veins or inequalities of the surface or the proximity of other scale insects. A convex scale becomes flattened when the insect occurs beneath the sheaths of the leaves, as on palms or bananas.

Color also varies notably, being influenced undoubtedly by climatic conditions, dryness or humidity, the presence of mold, or other fungi. The food of the insect on different plants undoubtedly also affects the character of the excrements. The effect

of weather and age in bleaching or otherwise changing the appearance of the scale is often notable. The characteristic appearance of the scale varies immensely in proportion as it has free room for growth or is crowded or massed together densely on the bark or leaves. The San Jose scale growing in scattered numbers here and there on the terminal twigs bears no resemblance whatever to the crowded masses on old, badly fested wood. The same is true of almost any other scale insect.

The covering scale, therefore, cannot be taken as a criterion of very great value in the separation of species, and by itself is almost without value. The specific characters must be found in the insect itself, the scale covering furnishing indications only of a rough sort. The describer of new species who fails to notice the importance of these sources of error, and sees a species, a sub-species, a physiological species, or a variety, in every such accidental difference, greatly retards rather than advances the knowledge of this group of insects. It would be just as legitimate to describe as a new species an insect found on the under side of a leaf as opposed to an insect found on the upper side, as to designate as new a species because a little extraneous matter is adhering to its scale covering, or to describe men as distinct species because they wear different colored coats.

When the insect itself comes to be examined, other sources of error present themselves. For example, the question of the maturity or adultness of the specimens under study arises, and also the problem of individual variation. In the determination of material it is, as a rule, absolutely necessary to have the adult female insect. In the Diaspinæ, for example, the full grown second stage of the female is often nearly as large as the third or last stage, if not larger in some instances, and yet the difference in the structural characters of the two stages is very great. As an example of a description of a new species from a failure to recognize the maturity of the specimens, Cockerell's so-called variety *lateralis* of Newstead's *diffinis* may be cited, *lateralis* merely representing the immature stage of Comstock's *cydoniæ*.

In the matter of individual variation, this is just as notable in scale insects as in man or other animals. The two halves of the anal plate of a female Diaspine are never exactly alike, and often vary within quite wide limits. In different individuals from the same colony such variations are still greater. Fortunately, however, the characters of real value in this group of insects are much more constant than one who had not studied the subject would suppose, even in the case of material representing the same species from widely separated quarters of the world and on totally dissimilar food plants. In the Diaspinæ, perhaps more markedly than in most other groups of insects, the specific characters are sharply and satisfactorily defined, and hence the

less excuse for the cumbering and befogging of the literature which has resulted from careless, hasty, and thoughtless work.

Minute differences in the pores or glands and appendages, or in the lengths of the joints of antennæ or legs, are usually individual and would often make two species of the same specimen if the latter were cut in half in the line of the main axis of the body. To return to an illustration already employed, one might as well describe men as distinct because they have Roman or Greek noses or short or long chins.

In other groups than the Diaspinæ, I cannot speak from careful personal study, but I have the gravest doubts of the value of descriptions based on slight variation in the lengths of the joints of legs and antennæ, all of which must be subject, within specific limits, to variation with the age of the specimen and with its condition as to abundance or scarcity of nourishment. In this connection I cannot do better than quote the views expressed relative to the group Lecaniinæ by Mr. Pergande in a recent letter to a correspondent, views in which I heartily concur. He says:

"With regard to the difference in length of one or the other of the antennal joints, * * * I will say that it is simply individual variation; even in the same specimens the comparative length of either of the joints of both antennæ varies frequently more or less. There is generally also a more or less perceptible variation in size, color, and shape in the same species, dependent in a measure on the food plant on which it may have established itself and also on the locality. Old specimens, which have attained their full growth and have died a natural death, are generally darker, if prepared for the microscope, than younger individuals of the same stage and with all the pores of the derm much more distinct. As to the shape of the individual scales and their sculpturing, I find in our material of typical specimens of *Lec. armeniacum* the same variations as those mentioned * * *. To consider every slight variation of specific value, would lead to endless species which nobody would be able to recognize, and which would cause endless trouble in the study of this most difficult group of scale insects."

The writer trusts that the foregoing criticisms will be taken in the kindest spirit as they are intended, and he does not wish it to be thought for an instant that he fails to recognize the learning and enthusiasm shown by the prominent workers in the Coccinæ, by no means all of whom have been equally guilty, and whose work in the main has been most excellent and commands the heartiest approval, but having experienced the great difficulty and labor necessary to discover and correct errors arising from the conditions criticised, the need of calling attention to them seems imperative.

The paper was discussed at length by Messrs. Cockerell, Howard, Ashmead, Gill, Sanderson, and Schwarz. Mr. Cockerell said that the paper was too general and could hardly be criticised in general terms. Only two specific instances were mentioned by the author. He expressed his belief in the value of the characters of the scale and also in the value of the characters to be derived from the measurements of the relative length of the antennal joints. He admitted the variability described by Mr. Marlatt, but insisted that by the careful study of extensive material we may reach the specific limitations of this variability and that the characters will thus be found to be of use. He spoke of forms which while practically impossible to distinguish morphologically, still had distinct geographical range and distinct food plants. He had made distinct species or varieties of such forms and believed himself justified in so doing. He referred to the fact that *Aspidiotus perniciosus* does not occur upon orange in California, while an undistinguishable form has been received from Japan occurring upon orange. He had made a variety of this Japanese form, although no distinct characters in the insect itself could be found.

Mr. Howard said that he could not help believing that this last mentioned Japanese form was distinct from the true *Aspidiotus perniciosus*. Referring to Mr. King's variety *fulvus* of *Chionaspis furfurus*, he said that type specimens had been sent to him by Mr. King before the variety name had been given, and that he had urged Mr. King not to make a new variety for it; he thought it entirely unnecessary, and, in fact, misleading, thus indicating his general agreement with the points laid down by Mr. Marlatt, with whom he said he agreed almost perfectly.

Mr. Ashmead said that he believed that the scale was of great importance in classification; that it frequently not only indicated specific differences, but generic differences, and that differences in the scale must represent differences in structural characters of the insect. These characters may be minute and difficult to detect, such as the secretory pores.

Dr. Gill, apropos to Mr. Ashmead's remarks, referred to the general subject of secretions and excretions of animals as expressive of morphological structures, and spoke particularly of the specific characters of the dejecta of mammalia.

Mr. Sanderson stated that in his field work on *Aspidiotus perniciosus* he found that he could readily distinguish between this species and *Aspidiotus forbesi* on account of the dent which the latter species makes in the bark, thus avoiding the necessity of making microscopic mounts of the two forms and studying the minute specific characters of the anal plate.

Mr. Schwarz said that this was a good instance of the value of field work even in the differentiation of species. In classificatory work there has been too much confinement to cabinet specimens; we need much more field work on the biology of species.

Mr. Cockerell, continuing, said that he must insist that there are such things as physiological species, and referred to the fact that Professor W. G. Farlow had recently in his address before the American Association for the Advancement of Science at Boston stated that undoubtedly physiological species exist among the fungi.

Dr. Gill said that in the lower forms of life physiological characters are used because we are unable to distinguish them by morphological characters, and suggested that physiological species are in reality precursors of morphological species. Even in the higher insects, as in Lachnosterna, forms distinguishable by genitalia alone are to a certain extent physiological species, but will eventually become differentiated by other characters.

Mr. Cockerell said that perhaps we might better term such forms now called physiological species, histological species. Characters leading to the survival of forms, but difficult to determine from museum material, are frequently histological characters.

Mr. Schwarz, indicating as his idea of the physiological difference in forms, gave as an example the little two-spotted lady-bird, *Adalia bipunctata*, which in Europe is extremely variable in color, but in America is always constant in color.

Mr. Ashmead said that he does not believe that there is such a thing as a strict physiological species. He spoke of the correlation of habits and structure, especially among the wasps, where the slightest differentiation in structure was shown to be correlated with a difference in habits, and vice versa.

Mr. Howard said that in parasitic Hymenoptera he had always insisted that a difference in habit would ultimately be found to

correspond to a structural variation, however difficult this might be to detect.

MAY 16, 1899.

The 144th regular meeting was held at the residence of Mr. J. D. Patten, 3033 P street N.W. Vice-President Gill in the chair, and Messrs. Pollard, Schwarz, Currie, Patten, Caudell, Morris, Heidemann, Chapin, Ashmead, Vaughan, Dyar, and Howard also present. The Secretary called attention to the fact that the vacancy in the office of President of the Society, caused by the lamentable death of Mr. Hubbard, had not been filled, and on his nomination Dr. Gill was elected President.

Under the head of Short Notes and Exhibition of Specimens, Mr. Schwarz stated that he has had great difficulty in ascertaining any facts concerning the distribution of Lepidoptera in Arizona from published accounts, and asked whether exact localities were known for this State. Dr. Dyar replied that most if not all forms were labeled simply "Arizona," and that there was practically no knowledge of exact localities in this order for the State of Arizona.

Mr. Chapin stated that last year he collected *Anthocaris genutia* in some number, and that there were 16 males to 1 female. He wished to know whether this difference in proportion of the sexes is constant. Dr. Dyar stated that it is not constant, and that the instance mentioned was probably due to the fact that the specimens were collected at a time when the males had issued and the females had not yet issued in number. Dr. Gill jocularly remarked that probably the males were not eventually transformed into females, and went on to mention Myxine and its protandrous qualities as first appreciated by Dr. Nansen.

Mr. Heidemann exhibited a series of *Aradus niger* Stal., and submitted the following note on the habits of this species:

NOTE ON ARADUS (QUILNUS) NIGER STAL.

By OTTO HEIDEMANN.

Stal in his "Enumeratio Hemipterorum" III, p. 137, in which he arranges the family of Aradidæ, gives also a description of two species, one European, from the Island of Cyprus, and the other from N. America (*Carolina meridionalis*). These two differ from the other species of the genus Aradus in the shortness

of the rostrum, which hardly reaches the base of head. On account of this distinction Stal has placed them in a Subgenus, Quilnus Stal, and described the American species, ♂ and ♀ winged, as *Aradus* (Subg. *Quilnus*) *niger* Stal, Museum Stockholm. There is no record of the existence of this Aradid in any American collection, nor is it mentioned by collectors. Mr. Uhler, who has described most of our American species, writes me about this interesting insect, as follows:

"With regard to *Aradus niger* Stal, I find no specimen in my collection that suits the description in Enum. III, p. 139, 13. Of course, I would be delighted to get a ♂ and ♀ of this very singular species. I congratulate you most heartily upon discovering such an interesting insect." During the winter month I collected it in the woods near Soldier's Home, where there is quite a variety of timber, also many Pine trees. Two years ago a high wind storm had rooted out and broken down a great number of these trees. The Aradids live, as is generally known, mostly under bark, or in the crevices of the bark, where they lay their eggs and propagate. When the tree begins to decay it is easy to loosen the bark from the trunk, and the collector has a much better opportunity to find rare Aradids and large series of specimens, than by beating the branches of the tree. Collecting in this way, I have enlarged my collection of Aradids very considerably. I found large series of *Aradus similis* Say, *A. acutus* Say, *A. crenatus* Say, *A. inornatus* Uhl, an undescribed species and *A. niger* Stal, also series of the genera *Brachyrrhynchus granulatus* Say and *Neuroctenus simplex* Uhl. On one of my collecting trips I found by peeling off some pine trees an Aradus new to me. The insect would have escaped my notice if it had not been for the peculiar form of the last genital segment and flaps; it was a male. The insect hides between the rubbish and decaying matter that accumulates under the loosening bark, and as the color of this species is very dark, it is only by scrutinous searching that one is able to find the insect. In examining this interesting Aradus I was struck by the shortness of the beak, and recollecting this a characteristic of the Subgenus *Quilnus* Stal, I compared the insect with Stal's description of *Aradus* (Quilnus) *niger* Stal, which fits the same very well. Being eager to get as many as possible of it, I was fortunate enough to find more than a dozen in the winged state, ♂ and ♀. The female is a little larger in size than the male, and the wings are a trifle shorter. I have observed the winged ♂ in union with the unwinged ♀, and also both sexes in the unwinged state.

—Some discussion followed on the habits of Aradidæ. Mr. Ashmead stated that in Florida the second year after a tree is cut down the bark loosens and at this time Aradidæ are found under

the bark but not the year later. He referred to a peculiar form found in the winter time under the bark of dead orange trees in all stages of existence. Mr. Heidemann thinks that the Aradidæ feed on fungi. Mr. Schwarz stated that, in his experience, the family may be divided into two classes, according to food habits, the one appearing to feed upon a blackish mould under the bark, while others live outside of the bark of dead trees, upon a whitish fungus. Mr. Caudell stated that in Oklahoma he had found the same species two years in succession on a burned red-oak tree.

—The second paper of the evening, by Dr. Dyar, was entitled "A New Species of Bertholdia," the description being accompanied by the exhibition of specimens of the new form, *B. soror*, and also of three allied species.

A NEW SPECIES OF BERTHOLDIA.

By HARRISON G. DYAR.

Bertholdia soror n. sp.

Head brown, orbits crimson, palpi white, crimson above; thorax russet brown with a few red scales, edges of tegulæ grayish; abdomen crimson above, white below, with lateral black dots; legs white, knees gray, fore femora red above. Fore wings lilacine gray, the basal half irregularly suffused with light ocherous brown; an oval white spot on the middle of vein 1; subapical hyaline area shaped as in *philotera*, faintly edged with reddish, but without a black border and the dots on the veins 5 and 6 are faint and gray. Hind wings white, semihyaline, inner margin pink. Expanse 32-34 mm; one male, two females; Venezuela (Hrdlicka). U. S. Nat. Museum, type no. 4252.

Synopsis of Species.

Hind wings smoky gray, darkest on the outer edge.
  Fore wing brown; hyaline space dentate, its upper portion retracted; dot on vein 1 yellow...... .*philotera* Druce.
Hind wings nearly hyaline, a narrow gray terminal line.
  Fore wing gray; hyaline space dentate, its upper portion not retracted; dot on vein 1 yellow....*specularis* H.-S.
Hind wings white without gray border, but rarely a touch of gray on the veins in the female.
  Teglulæ not white bordered.
    Hyaline patch dentate.
      Spot on vein 1 yellow or absent. .*schausiana* Dyar.
      Spot on vein 1 white...... ....*soror* Dyar.
    Hyaline patch not dentate, prolonged below toward the enlarged yellow dots................*trigona* Grote.
  Tegulæ white bordered, forming a white spot in the middle of the collar.
    Fore wing with purple discal area and white submarginal line...................*albipuncta* Schaus.

As it seemed from the description that the species of this genus were distinguished largely by color, discussion followed in regard to the taxonomic value of color. Dr. Gill spoke of the great variation in the value of color in different groups of animals. In birds, for example, the color seems to be very constant, while in certain mammals it is very variable in the same species, although the modern school of mammalogists are coming to use color variations as specific. With shells there is great color variation. Dr. Dyar said that in some groups of moths the color was variable within specific limits. Mr. Schwarz said that in beetles the value of color differed in different groups. In the Cicindelidæ there is considerable variation, but it follows a definite, law as pointed out by Dr. Horn. In the Coccinellidæ and Chrysomelidæ, many species are very variable, but there the law of variation is obscure, while occasionally species may occur which are perfectly constant in color. Mr. Ashmead said that the wing pattern is of considerable importance in the classification of the parasitic Hymenoptera. In such genera as Perissopterus, Decatoma, Cerapterocerus, Eusemion, Chiropachys, Habrolepis, and many others, the color pattern of the wing is of generic value. Dr. Gill said that most naturalists refused to use color in a generic sense, but some, like Seebohm in the Turdidæ, have used it extensively. Mr. Ashmead spoke of the eggs of birds as possessing specific characters. Dr. Gill said that the characters used by oologists were of little value.

Mr. Ashmead said that the eggs of insects frequently possess valuable characters, even of family rank, such as those of the Pentatomidæ and certain groups of Lepidoptera. Mr. Schwarz referred to Rupertsberger's rare work on the classification of insects from the eggs, and Dr. Dyar referred to Chapman's work on the eggs of Lepidoptera.

—The third paper of the evening was by Mr. Schwarz, entitled :

ON THE INSECT FAUNA OF THE MISTLETOE.

By E. A. Schwarz.

Kaltenbach mentions four species of insects living upon *Viscum album* in Europe, viz., *Psylla visci* Curt. (*exophila* Frfd.), *Aspidiotus visci* Frfd., and two Cerambycid beetles of the genus Pogonocherus. The latter, however, have been bred

also from other woody plants. In the United States only one insect has hitherto been recorded from Phoradendron viz., *Lecanium phoradendri* Ckll., but there is in the National Museum an undescribed Psyllid discovered on *Phoradendron macrophyllum* in California, by Mr. A. Koebele, which in the wing venation differs remarkably from all described genera of the subfamily Psyllinæ. Finally, Prof. Cockerell kindly informs me that he had described three species of Coccidæ as occurring on mistletoe in Mexico.

In the vicinity of our eastern cities the mistletoe is well-nigh exterminated since many years or confined to the very tops of tall trees, but in the southwest these parasitic plants, more particularly *Phoradendron macrophyllum*, are still extremely abundant on trees growing along water courses, and the following fragmentary observations were made by me, in April, on two short visits to the mouth of Bear Canyon[1] in southern Arizona. The majority of the more accessible mistletoe bushes proved to be more or less infested by *Lecanium phoradendri* and, in many instances, plants had been killed by the prevalance of the scales. A search for Coccinellid enemies produced, after considerable exertion, only a few specimens of *Cephaloscymnus occidentalis* Horn.[2] Occasionally mistletoe branches, either not or but feebly infested with scales, were observed to be dead or wilting, and it was found were hollowed out for a distance greatly varying in length, according to the thickness of the twig. The author of these galleries proved to be a Curculionid larva of the genus Otidocephalus, the particular species being still undescribed. The beetle makes its exit through a round hole at the side of the twig, and the deserted gallery is then usually occupied by a colony of ants, *Cremastogaster* sp., which attend to and protect the Lecanium scales.

The infested twig is not killed at once by the boring of the Otidocephalus larva, but remains green for one season or longer, but at any rate long enough to allow colonies of a Scolytid beetle to undergo one or two generations in the terminal portion of the twig. This Scolytid, one of the smallest in our fauna, is also undescribed, and belongs, as far as I can make out at present, in the neighborhood of Stephanoderus. It is an "inside borer," but no regularity whatever can be observed in the tiny galleries, nor could we see any trace of "ambrosia." The colonies are extremely

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[1] This locality is situated about 3 miles northwest of the abandoned Ft. Lowel, Pima Co., at the foot of the Santa Catalina Mts.; altitude 2,900′.

[2] This species was subsequently found by Mr. Hubbard and myself in the Sta. Rita Mts. and at Oracle among a Lecanium scale on various oaks, and among a diaspinous scale on *Quercus arizonica*. The eastern species, *C. zimmermanni* Cr. feeds on *Aspidiotus ancylus*. For some reason not yet ascertained both Coccinellids and their larvæ are extremely rare in spite of the abundant and apparently permanent food-supply.

populous, a single one containing between 70 and 100 specimens, but the males appear to be just as rare as in Xyleborus.

In one instance another borer in Phoradendron twigs was met with, viz., a Bostrychid larva. This was bred and produced a somewhat crippled specimen of an undescribed species of Amphicerus. The species was not met with elsewhere in Arizona, but is probably not peculiar to the mistletoe.

The Californian Psyllid mentioned above was not observed at any place visited by me in Arizona, but a Lycænid larva was not rare feeding on the leaves of Phoradendron. Several imagoes were bred, and Dr. Dyar determined the same as *Thecla halesus.*

Mr. Dyar stated that the published records show the food plant of this Thecla larva to be oak. This he thought probably was a mistake and mistletoe is its true food. Mr. Ashmead said that the live oaks in the city of Jacksonville, Fla., were covered with mistletoe, especially at the tops. He has seen a scale insect and an Aphid on the mistletoe, but has never worked either of them up.

—Mr. Pollard asked whether any insects were known to feed upon the Spanish moss (Tillandsia) in the South. Messrs. Ashmead and Schwarz replied that this moss is full of insects, but they thought that none of them feed upon it, although Mr. Schwarz stated that *Monocrepidius vespertinus* eats the leaves occasionally. Mr. Morris stated that in the moss used in packing he had seen a breaking or eating of the ripened pods, but was not sure that it was caused by insects.

Mr. Schwarz read the following letter written by Mr. Hubbard in 1894, on the fauna of Florida caves:

INSECT LIFE IN FLORIDA CAVES.

By H. G. Hubbard.

Crescent City, Fla., *July 31, 1894.*

I found so much to do at Eustis with Webber and Swingle that I spent four or five days with them in the laboratory. Just as I was thinking of leaving them, Mr. Swingle received a letter from an old-time guide of his telling about some large caves in Hernando and Citrus counties. As they are only 30 or 40 miles west of Eustis, we concluded to visit them and explore, but we found much trouble in getting there. However, we reached Istachatta on the Withlacoochie river after a night's traveling. We found here extensive but shallow and muddy caves. I should say about

100 acres entirely cavernous—caves all connected by a network of small galleries and rat holes, with occasional air holes to surface and some fair-sized chambers filled with bat guano. Had to crawl about on hands and knees over mud composed of red ochre, and got well plastered and painted red like Indians. We three were four hours in one cave and lost our way, so had to look around for another opening. Fortunately we found one just as our candles were giving out and came up to daylight through a very small chimney about 500 yards from where we went in. Found almost nothing but bats in this cave—no insects except a Podura and a small dark cricket.

Next day we went across the country, 8 or 9 miles in wagon, to Double Hammock country, in Citrus County, and found a very much larger cavern, 75 to 100 feet deep, in hillside in open pine woods. Chambers in this cave were very large, 150 feet long by 40 feet wide, and 20 or 25 feet high. Chambers were all very much deeper, but lower portion of all of them was filled with clear, cold water. Had much trouble to get around in the cave because of the water. There was much loose and fallen rock, so that we managed to get over the deep places by climbing from rock to rock or by clinging to the side walls. In the water were white crawfish very much like those in the Mammoth Cave, but we saw no fish. Got a good lot of the crawfish, mostly small specimens, but one or two big ones as large as *Cambarus bartoni*. The creature has eyes, but they are without pigment and entirely sightless.

In this cave there was no mud, only white phospatic rocks full of fossil echinoderms and crustacea. In some of the larger chambers, however, there were tons of bat guano. The bats were also present in tons' weight clinging to the roof and flying about, to our great annoyance and danger, since they constantly put out our lights with their wings. These bats proved to be very interesting, however, as they were infested with parasites in millions of specimens. Beside the ordinary small mites on the wing membranes, they were attacked by a winged Hippoboscid fly (*Trichobius major*) which hovered about the clustered bats and ran over the walls of the cave, and a wingless Nycteribid fly which rarely left the bats. In the neighborhood of the bat rookeries the walls were black with the puparia deposited by the Trichobius females, and once or twice we captured a pair of these winged flies clinging together in copulation. I took some puparia that had not disclosed, in a dry vial, and one of them has produced the imago.

The freshly fallen dung of the bats was covered with such multitudes of Acari that its color was changed from jet black to chestnut brown. The living mites formed a layer of an inch thick; a moving, struggling mass through which we had to

wallow and often crawl on hands and knees. When we disturbed the pendant masses of chattering bats, they disentangled themselves and flew away into deeper recesses of the cave, leaving behind them such swarms of the winged parasites that we were almost suffocated by them, and as they sought a shelter in our hair, beards, and even our eyebrows, the nuisance quickly became intolerable, so that we had always to beat a hasty retreat into some less infested passageway until quiet was again restored. There was also about the bat chambers, apparently living in or about the dung of the bats, a number of other flies, one of which was apparently rare and equal in size to a blue-bottle fly. It is, however, a hairy Muscid which looks unfamiliar to me. More numerous by far is a minute black gnat.

On the walls in the first large chamber, 75 feet below the mouth of the cave, we found a few specimens of a very large mite, quite like a small tick and evidently an interesting cave species. It is white with pale evanescent markings on the dorsum, and is quite flat and tick-like in form. We found it hiding cleverly in small but deep pits in the white marly walls of the cave, remote from the bat roosts. There were of course a number of spiders. One is a large crepuscular species quite like those found in small Kentucky caves. There are, however, some small colorless species belonging evidently to true cave genera, and resembling Authrobia. Scolopenders were conspicuous by their absence except at the mouth of the cave, and there were no crickets found. A small pale-red cockroach does not seem to be common, and is apparently not remarkable. A minute Hemipteron was not uncommon on the surface of the water in pools deep within the cavern My specimens all look like immature and very young skippers, but certainly do not belong to any common forms above ground. They are dark colored, and evidently closely allied to the small Hemiptera found on the surface of springs and pools in shaded forests.

We were so much interested in this cave that we gave two days to its examination. A log farm house near by sheltered us at night, and we had pot luck with the hospitable cracker whose farm adjoined the cavernous region. Webber and Swingle made a notable collection of moulds and cave fungi, and I salted down a good series of articulates. The cave we have named the Gum Tree cavern, from a large sweet gum tree which grows on the verge of the sinkhole at the entrance. It is situated in the southwestern corner of Citrus County, and about 8 miles from Floral City, on the S. S. O. & G. Railroad. The rocks here are all phosphatic, and the entire region is dotted over with phosphatic mines in active operation.

JUNE 1, 1899.

The 145th regular meeting was held at the residence of Mr. Frank Benton, 1801 Harewood avenue, Le Droit Park. In the absence of the President and the Vice-President, Mr. O. F. Cook occupied the chair; and Messrs. Schwarz, Morris, Vaughan, Chapin, Curry, Heidemann, Waite, Johnson, Benton, and Howard were also present.

Under the head of Short Notes and Exhibition of Specimens, Mr. Schwarz spoke of the fact that it is always interesting to observe in a new country the insects which are liable to become agricultural pests after the region is settled. In the Northwest, for example, the flora contains so many species allied to cultivated plants that there are many native insects which will probably eventually attack crops; in the extreme Southwest, however, there are very few such plants. In Arizona, nevertheless, there is a wild grape—*Vitis arizonica*—and he, as well as Mr. Hubbard, had made some observations on the insect enemies of this plant. They comprise an interesting mixture of native localized forms and widely distributed species. There is no Phylloxera and no Erythroneura, but there is a Procis which also attacks cultivated grape, and also some big Sphingid caterpillars which seem to be identical with the eastern species. He also exhibited specimens of the following Coleoptera observed on grape in southern Arizona: *Macrodactylus uniformis* Horn, found by Mr. Hubbard injuring wild grape, peach trees, etc., in Cave Creek canyon, Chiricahua Mts., and at Fort Grant. *Fidia humeralis* Lef., hitherto not known to occur in the United States, found by Mr. Hubbard on wild grape in the Chiricahua Mts. *Haltica carinata* Germ., quite abundant wherever wild grape grows; known to injure cultivated grape in southern California. *Spermophagus* n. sp., abundant everywhere on wild grape at an altitude of from 4,500 to 6,000 feet; its natural history not yet known, but the larva most probably living in the berries. *Craponius* n. sp., very common on wild grape in Madera canyon, Sta. Rita Mts., differing from *C. inæqualis* in the formation of the tibiæ and practically belonging to the genus Auleutes. *Desmoglyptus crenatus* Lec., abundant on wild grape in various places at an altitude of about 4,500 feet; larval habits as in Ampeloglypter.

Mr. Johnson remarked that he had received reports from different parts of Maryland the present spring to the effect that *Macrodactylus subspinosus* had been very destructive to the strawberry crop, damaging the flowers and the fruit.

—He also spoke of an injurious occurrence of *Systena tæniata* which had destroyed forty acres of tomatoes owned by one farmer and eighteen acres of the same crop owned by another. Six weeks ago 120,000 pear trees in a nursery in Dorchester County, Md., were attacked by the same insect, which gnawed the terminal buds. Two systematic sprayings a week apart with Paris green and Bordeaux mixture stopped the damage.

—Mr. Johnson further exhibited specimens of pea vine ruined by a new species of Nectarophora, and gave an account of the extraordinary damage which this insect had done the present spring on the banks of the Chesapeake Bay. As the weather had been dry, Mr. Howard remarked on the unusual character of the occurrence, since in his experience plant lice seemed to thrive most in wet seasons. Mr. Schwarz said, however, that in Arizona plant lice were very abundant in the dry season of April and May.

—Mr. Johnson also showed specimens of a new Asparagus insect, *Drosophila funebris*, the larvæ of which work underground in asparagus shoots. Both Messrs. Schwarz and Howard remarked that from the known habit of the genus Drosophila, there must have been something the matter with the asparagus before it was attacked by the insect.

—Mr. Howard showed drawings of *Melanolestes abdominalis* and *Coriscus subcoleoptratus* and gave an account of bites inflicted by these insects, stating that in his opinion these species, as well as *Conorhinus sanguisuga* and *Rasahus thoracicus*, are responsible for some of the reported cases of spider bites. Mr. Schwarz said that he had been twice bitten by *Melanolestes abdominalis* the present spring in his room in Washington, both times without having attempted to capture the insect or provoke it. The bite was severe and was painful for a couple of days. He further said that in his opinion the early stages of Conorhinus are passed, in the West, in the nests of rats and other burrowing animals. The bite of this insect is very bad and occasionally dangerous. In 1898 Mr. H. G. Hubbard was bitten in Arizona

when sleeping on the ground, and the bite grew worse for two weeks and was not cured for about four weeks. He himself had found larvæ filled with his blood in his bed-clothes when camping out. The insects were always numerous when rats were about, when he and Mr. Hubbard had found larvæ and imagoes in rats' nests. The larvæ did not enter houses, though the adults do. The latter on entering a house seem to fly immediately to the beds.

Mr. Currie stated that Mr. G. N. Collins had shown him a Liberian Reduviid which had bitten him most painfully. It was the most painful bite he had ever experienced. The bug was nearly an inch long and had variegated colors.

—The first paper of the evening was by Mr. Heidemann and was entitled:

REMARKS ON THE SPITTLE INSECT, CLASTOPTERA XANTHOCEPHALA GERM.

By Otto Heidemann.

About the middle of August last year I noticed some white frothy masses clinging to the stems of Chrysanthemums, which I had planted early in spring at my home. Observing the plants more closely, I found that the white froth was the secretion of a "spittle" insect, commonly known to be produced by the larva of a Homopterous insect, belonging to the family *Cercopidæ*. Being interested in ascertaining what species attacks the Chrysanthemum, I cut off some infested plants and placed them in a glass jar in order to rear the insect. Unfortunately, I had not much success in observing the insect in its several stages of development, because most of the immature ones had left their liquid coverings and perished; others ceased to suck the sap and did not form the frothy mass again for concealment, which consequently evaporated and dried up, and most of the insects shriveled and died. I obtained only one perfect adult, which proved to belong to the species *Clastoptera xanthocephala* Germ. var. *glaucus* Ball. This species occurred also, as I had observed at the same time, in very great numbers on the common weed, *Ambrosia artemisæfolia*. This weed is perhaps the original food plant, and the insect may have attacked the Chrysanthemum accidentally, as the ragweed grows profusely on the fields in my neighborhood. However, I know that the same

insect has been found infesting Chrysanthemum and Aster at other places in the District.

Dr. J. A. Lintner, in his 4th and 5th Reports on the injurious and other insects of the State of New York, gives an account of his observations of *Clastoptera obtusa* Say living on the black alder and also cites some other genera of "spittle" insects. I have noticed the secretions of the same species on the black alder very abundantly last year around Washington.

Much attention has been paid to the spittle insects by the naturalists of former days. Swammerdam called it "Locusta pulex", Linnæus placed it amongst the Cicadidæ. De Geer, in his Memoires pour servir à l'Histoire des Insects (Tom. 3, 1741), has given a most accurate description of the manner in which the young insects produce their frothy coverings. There is also a very interesting statement on the same subject in "Insecten Belustigungen," by A. Joh. Rœsel v. Rosenhof, Part III, pp. 139–144, 1749. This author corroborates the same facts that De Geer had observed, namely, that the so-called "spittle" is the secretion of immature insects, issued from the terminal part of the abdomen from the anus. He observed four distinct molts before the imago emerged from the pupa state. As a curiosity he refers to the common belief and superstition which the people held about the origin of the peculiar spittle masses on plants. Some believed it to be the spittle of the stars, or the evaporation of the earth; others presumed the spittle was caused by the perspiration of the plant itself. The frothy accumulation often is called "cuckoo-spittle," and Rœsel states, as a fact that the cuckoo preys on the young insects; he had found them in the stomach of the bird.

By carefully brushing off the frothy substance from the stem of the Chrysanthemum, I observed several larval insects in different stages of development in one spittle, some sitting head downwards, others head upwards, sucking the sap of the plant. The insect thus disturbed would soon select another place and begin sucking again. After a while it begins to move its abdomen vigorously, raising the terminal part high and by quick motions discharges from the anal segment small globules of liquid, continuing this process until it has covered itself all over with the white secretion. In the course of time the globules of the secretion diminish in size and number as the air in them slowly evaporates. Then the insect renews its liquid covering. Further, I observed that when the pupa is ready for the last molt, it comes out of the secretion, running around on the plant animately. Remaining at last in one place, but constantly moving its hind body, it begins to shed the skin, emerging from the pupa state as a winged adult.

PLATE VI.

EXPLANATION OF PLATE VI.

CLASTOPTERA XANTHOPHALA, *var. glaucus.*

a. Chrysanthemum branch showing the spittle.

b. Terminal part of abdomen of Clastoptera with the anal segment open and in action.

c. The same in repose and closed.

d. Young larva.

e. Grown larva.

f. Pupa with wing pads.

g. Winged adult.

h. Front part of head of adult.

—Mr. Cook read the following paper:

DUOPORUS, A NEW DIPLOPOD FROM MEXICO.

By O. F. COOK.

As part of a small but interesting series of Mexican Diplopoda collected by Mr. O. W. Barrett, this peculiar member of the order Merocheta is worthy of special mention. It agrees with Stenodesmus Saussure and Biporodesmus Attems, and differs from all other known Diplopoda in the possession of but a single pair of repugnatorial pores, located on the fifth segment. But notwithstanding the resemblance in this particular, it is evident that the new form has little, if any, affinity with either of the above genera. Stenodesmus, also a native of Mexico, is a large animal (65 millimeters) with a granular-tuberculate dorsal surface and a spine on the second joint of the legs, which last feature has been supposed to ally it with Fontaria. The South American genus Biporodesmus is also an animal of considerable size (45 millimeters), with a flat or concave, granular dorsum, a vertex sulcus, and complex, three-pronged copulatory legs, to say nothing of minor discrepancies. The new genus, to be called Duoporus, has a small, rather slender body, much narrower behind than in front, and gradually tapering from near the head. The dorsal surface is strongly convex, smooth and shining, and the posterior corners of the carinæ are long and spiniform. The copulatory legs are remarkably simple, the second joint consisting of a simple falcate process; they thus bear a much greater general resemblance to those of Sphæriodesmus than those of Biporodesmus.

The existence of three such distinct types with the same pore-formula is, however, but one of many evidences that pore characters, though of great systematic utility in the Diplopoda, do not

of themselves justify either wide systematic separation, nor, on the other hand, do they supply evidence of close affinity. There appear, in other words, to have been many independent aberrations of the normal pore-formula of the twenty-segmented Diplopoda, and as these variations have probably not been encouraged by selection and have had little or no bearing upon other aspects of the evolution of the group, there is little reason to expect that it will be possible to utilize the pore-formulas as primary characters in the presentation of a phylogenetic classification of the order Merocheta.

Duoporus, new genus.

Type: *Duoporus barretti*.

Distribution: Mexico.

Body small; about seven times as long as broad; broadest in front; gradually narrowed caudad.

Antennæ slender, distinctly clavate; joints in order on length, 6, 2, 3, 5, 4, 1, 7. Joints 3 to 5 subequal, but distinctly smaller than 6 and 2, which are also nearly equal in length, but 6 is much broader and slightly longer Olfactory cones four.

Vertex smooth, strongly convex, the suture distinct, but the sulcus wanting.

First segment semi-elliptic; broader than the head, slightly narrower than the second segment; slightly emarginate in the middle behind, and with a fine raised rim on the anterior and lateral margins; corners not produced.

Segments dorsally rather strongly and evenly convex, the surface smooth and shining, not marked by a transverse sulcus or depression.

Lateral carinæ moderately broad, about one-fourth as wide as the body cavity, inserted near the middle of the side; broader on anterior segments. On all segments behind the second the carinæ are more or less falcate, that is, emarginate on the posterior margin, and with the posterior corner sharply produced caudad; this feature is much more pronounced on posterior segments, the carinæ of which are narrow and sharply spiniform. With the exception of a very minute notch near the rounded anterior corner, the margin is entire, thin, and with a very fine raised rim.

Repugnatorial pores present only on segment 5, the aperture minute and without a raised rim; located in a distinct depression just inside the unmodified raised margin of the carina.

Supplementary margin very short, concealed under the posterior margin of the segment.

Last segment longer than the preceding, subtriangular in outline, with apex abruptly narrowed and truncate; setiferous tubercles minute.

Anal valves smooth, margin slightly prominent, setiferous tubercles minute.

Preanal scale nearly as long as broad, rounded, apex not produced; tubercles obsolete.

Sterna nearly naked, smooth, a small conical spine at the base of each leg, larger on the posterior pair and more acute on posterior segments.

Anterior legs of male slightly crassate, joints unarmed.

Second legs of male with coxæ produced posteriorly into sharp conical processes.

Male genitalia with the basal joint rather large, prominent, and bulb-like; second joint simple, subfalcate.

Duoporus barretti, new species.

Type: Deposited in the U. S. Nat. Museum (No. 781).

Locality: Cuernavaca, Mexico.

Length, 12 to 14 mm.; width, 1.9 to 2 mm.

Color of fresh alcoholic specimens pale purplish.

In the absence of cephalic and dorsal sculpture and other features usually treated as of specific importance, little in the way of specific description can be written to any purpose until other species are discovered.

Legs rather sparsely hirsute with short hairs; the conical processes of the basal joint of the second pair of legs of the male may possibly consist of agglutinated hairs, though this is improbable. They arise from the posterior rather than from the ventral face of the joint.

The copulatory legs are also remarkably simple; the basal joint is rather prominent, subcylinderic and nearly naked; the apical is bent cephalad near the base, and tapers abruptly into a simple subfalcate process which keeps its size to near the rather blunt tip.

The above description is based on three male specimens collected at Cuernavaca, Mexico, in 1898, by Mr. O. W. Barrett, for whom the species is named.

—The last paper was by Mr. Benton and was entitled "Queen Clippings, and the management of bees in swarming." The speaker remarked upon the difficulty of deciding as to the advisability of clipping the wings of queens, and gave some details as to the proper method of handling swarming bees.

November 2, 1899.

The 146th regular meeting was held at the residence of Mr. C. L. Marlatt, 1440 Massachusetts ave. President Gill in the chair, and Messrs. Johnson, Dyar, Motter, Ashmead, Caudell, Busck, Vaughan, Schwarz, Marlatt, Heidemann, Uhler, Benton, Patten,

Howard, and Currie, active members, and Kotinsky and Stetson, visitors, present.

Mr. Schwarz announced the death of Mr Hugo Soltau, a corresponding member, and the further fact that by Mr. Soltau's will his extensive collection of Coleoptera was bequeathed to the National Museum.

Under the head of Exhibition of Specimens and Short Notes, Mr. Ashmead showed an insect constituting a new genus of Bethyllidæ collected in Arizona by Mr. Schwarz. He also exhibited specimens of *Dinoura* (n. g.) *auriventris* n. sp and *D. cyanea* n. sp, which he had recently received from Mr. W. W. Froggatt, of New South Wales, who had reared them from galls of Coccids of the Brachyscelid group. The insects belong to the family Cleonymidæ, all the species of which are parasitic upon coleopterous larvæ, so that these Dinouras are probably parasitic upon coleopterous larvæ, feeding in the Brachyscelid galls. Mr. Schwarz said that in Europe there is an Anthribid beetle belonging to the genus Brachytarsus, which is a specific enemy of Lecanium scales; this genus is represented in Australia, and it is quite likely that one of its species is the true host of the Dinoura.

—Mr. Marlatt showed photomicrographs of the anal plate of a number of Diaspine scales. He showed both bromide prints and platinotypes, the former being better. From the results so far obtained, he believes that this will be an excellent method of illustrating or at least studying the obscure features of the anal plates of Coccidæ.

—Prof. Uhler exhibited specimens of certain Capsids, of which the females only had been previously known. They were, *Coquillettia insignis* Uhler, *C. amœna* Uhler, *Lobitodes integer* n. sp., *Myrmicides polita* n. sp., and *Orectoderus obliquus* n. sp., the males of these interesting forms having recently been found by Mr. Elmer D. Ball in Colorado inhabiting ants' nests. They are entirely different from the females, being wingless and resembling ants so closely in general appearance that it is a plain case of protective mimicry. In answer to a question, he said that we have now about 2,000 species of the family Capsidæ in America north of Mexico, but that many of the forms extend well down into South America. Mr. Ashmead spoke of the occurrence of winged and wingless forms in Hymenoptera as gener-

ally associated with dimorphism and frequently with alternation of generations. Mr. Uhler said that this could hardly be the case with the Capsids, for here we have a distinct gradation of of wing length. Mr. Ashmead said that he had a species of Scollops from Oregon showing an apparent dimorphism, but Mr. Uhler thought that the form might have belonged to one or more of several allied genera erected by Stal. Mr. Ashmead said that a point like this could only be settled by careful outdoor observations; the systematist working over a collection of insects is apt to lose true relationships, which can be established to the best advantage by field observations. Apropos to this remark, Mr. Howard mentioned the figure published in a recent number of the British Medical Journal as illustrating the difference between Anopheles and Culex in the resting position.

—Mr. Heidemann exhibited a Capsid, *Eccritotarsus elegans* Uhler, which had been found by Mr. Banks at Falls Church, Va., on *Euphorbia adenoptera*. Mr. Heidemann had also found it upon the same plant at Columbia Heights, D. C., and thinks that the Euphorbia is its food plant. The insect was originally described by Prof. Uhler from Illinois, and Mr. Heidemann had also taken it at Round Hill, Va. Mr. Ashmead said that he had seen the same insect from Texas. Mr. Schwarz called attention to the fact that the food plant is a native of South America, and Mr. Uhler remarked that Eccritotarsus is really a South American genus, some 30 species being known from that continent; in his own collection he has *E. elegans* from Boston and Texas, and a large series from Galesburg, Ill. The genus is remarkable in having only one loop in the membrane of the wing cover, and it has a greater width of curve than is usually found in the Capsidæ. Mr. Howard asked the faunistic value of the Capsidæ as a group, and Mr. Uhler said that they had not been carefully enough collected to enable him to judge of this point, and made some interesting remarks about collecting Capsidæ, crediting Mr. Heidemann and Mr. Elmer D. Ball with great success in this difficult task.

—The first paper of the evening was by Dr. Dyar, and was entitled:

A PARALLEL EVOLUTION IN A CERTAIN LARVAL CHARACTER BETWEEN THE SYNTOMIDÆ AND THE PERICOPIDÆ.

By Harrison G. Dyar.

It has been fully pointed out that the larvæ of the Syntomidæ have but a single wart on the meso- and metathorax above the stigmatal wart. This wart is formed from primitive tubercles ia, ib and iia, iib not forming a wart and being often discernible in the mature larva as a single hair. This character persists in all the Syntomid larvæ examined so far, though the hair clothing may vary from abundant tufts to single hairs, and the shape and size of the warts may vary equally. This single wart occurs in no other family (except as I will point out), at least in the same way. Occasionally one of the two normal upper thoracic warts is lost by becoming small and finally obsolete, but this is a different thing from the single wart formed by coalescence. In the Pericopidæ, however, this structure has been paralleled. The Pericopidæ are not very closely related to the Syntomidæ. The moths stand somewhat below the Arctiidæ and the larvæ seem to have likewise evolved separately, with an independent wart formation, probably from near the Dioptidæ. I have already described the beginning of coalescence of the upper thoracic warts in the larva of *Composia fidelissima;* the following descriptions will show the completion of this process and also review the larvæ of the North American genera.

Genus *Daritis* Walk.

Daritis howardi Hy. Edw. Mr. Cockerell has twice sent me (base of Organ Mts., New Mexico) larvæ which I am inclined to refer to this species, although they reached me in too weak a condition to allow of their being bred. They appeared as follows: Large, apparently strong and active, with large head and well developed normal legs. Irregularly banded, black and ocherous, the hairs sparse, arising from large warts with tufts of short dense hair from some, the others polished, blue-black or ocherous. In detail: Head large, not bilobed, flat before, the sides sloping; clypeus slightly depressed, its sides contracted, the paraclypeal pieces reaching not over half way to the vertex; antennæ moderate; ocelli distinct except the fifth (from above), which is very small; all jet black, polished, the epistoma and basal joint of antennæ and palpi white; width nearly 6 mm. Thoracic feet large, shining black; body uniform, joint 12 scarcely perceptibly enlarged; feet large, with densely hairy plates and well developed claspers of the Macro type. Warts large; on prothorax the

cervical shield is degenerate, bisected, each half with two warts on the anterior edge and a tuft of hairs at the upper inner corner; prestigmatal wart nearly fused to the shield; subventral wart large. On meso- and metathorax, three large warts on each side (ia+ib+iia, iv+v and vi), the rudimentary hairs (iib and iii) obsolete. On the metathorax the upper wart shows a small boss on its upper side, indicating its compound nature. On the abdomen wart i large, but smaller than ii; iv smaller than iii but pushed up above the spiracle almost in line with and approximate to iii; v and vi large, crowded together obliquely. All the warts are so large as to be somewhat crowded. Warts polished, except ii of joints 5 to 12, which is covered with a dense tuft of short barbuled hairs in addition to the rather sparse long black hairs that all the warts bear. Ground color dull ocherous, a broken dorsal black stripe and irregular subdorsal and subventral spottings, the warts of the pale segments ocherous, the short hairs of wart ii brown. Joints 5, 6, 9, 11, and 13 are heavily transversely banded, somewhat irregularly, with black, their warts polished blue-black, the short hairs of wart ii black. Warts of joint 2, the upper and lower warts of joint 3, and the anal flap also black. Long hairs but sparsely barbuled, structure of the Arctian type.

Daritis sacrifica Hübn. I possess a badly shrunken cast skin of this species sent me by Mr. G. Ruscheweyh (Buenos Aires, Argentina). The head closely resembles that described above, except that the episotma is dark; it is polished black; width about 4 mm. The warts are large, part polished blue-black, part pale yellow. The single (?) large subdorsal wart of meso- and metathorax seems to have been black and given rise to a single very long, smooth, white hair, besides the usual rather sparse, black, barbuled ones. Thoracic feet and anal flap black. Hairs black and white mixed. I cannot make out further details with certainty.

Genus *Composia* Hübn.

Composia fidelissima H. S. The details of this species have been given elsewhere. (See Journ. N. Y. Ent. Soc., iv, 68–72.) The upper thoracic warts are joined on the mesothorax, but still separate on the metathorax.

Genus *Gnophæla* Walk.

Gnophæla latipennis Boisd. Some well-preserved larvæ of this species are in the collection of the National Museum (prepared by Kœbele, Siskiyou Co., California). The larva is a handsome animal; its general appearance has been noted by Lord Walsingham (Stretch, Papilio ii, 82), but it is finer than the larva of *Callimorpha dominula*, with which he compares it. Head

rounded and full, distinctly wider than high, not bilobed; clypeus slightly contracted at the sides, proportionately higher than in the preceding genera, the paraclypeal pieces reaching about three-fourths of the distance to the vertex; dark red, polished, labrum, ocelli and antennæ black; width about 4 mm. Body cylindrical, joint 12 very slightly enlarged. Thoracic feet large, the abdominal ones moderate with well-developed hairy shields. Warts fairly large, especially ii and iii, i and iv small, but not minute. On prothorax two small warts on each half of the degenerated cervical shield and a group of hairs posteriorly; prestigmatal and subventral warts large. On meso- and metathorax, three large warts on each side, the upper elongate, and on the metathorax, marked with a slight suture, showing its compound nature. On abdomen wart i somewhat smaller than iii, iv exactly behind the spiracle except on joint 12, where it is below it; v and vi large; anal plate somewhat corrugated, blue-black. Hair rather sparse, black and white mixed, a long single hair from the subdorsal wart on metathorax appears to have been present, though the hairs are somewhat broken in the specimens. Ground color black, all the warts shining blue-black. A very wide, deep yellow, dorsal stripe, strongly constricted between warts i and narrowly linear between the halves of the cervical shield; a series of lateral yellow bars, forming a broken line, broadly interrupted at the centers of the segments; a very broad stigmatal band, broken at wart iv, forming a series of intersegmentary lunate marks, irregularly lobed on the under side. Venter broadly pale yellow; all the feet black outwardly. Hairs all of one kind, sparsely barbuled.

Food plant, *Cynoglossum occidentale.*

The larvæ of *G. vermiculata* as described by Bruce and Cockerell, seem to be the same as this in all characters. I think that it will prove that *latipennis* and *vermiculata*, as well as *morrisoni* Druce, are only varying geographical forms of one species.

Specimens of the larvæ of *Daritis howardi*, *Composia fidelissima*, and *Gnophœla latipennis* were exhibted by Dr. Dyar.

—The last paper of the evening was by Mr. Marlatt, and was entitled "The penial structures of *Anasa tristis* DeG." Mr. Marlatt described with the aid of drawings the peculiar anatomical details of the organ and appendages of the insect named, and pointed out the value of the characters found in the genitalia of this and other Hemiptera as a means of classification. In discussion, Prof. Uhler said that he had corresponded extensively with Dr. David Sharp on the subject of the genitalia of the Heteroptera; Cham-

pion and Distant had made many species of the Heteroptera in the Biologia Centralia Americana, and that he had rather taken them to task for separating forms on small differences; no one but the field collector knows how to distinguish perfectly between forms of arrested maturity and those which are fully mature; unless one collects both sexes in large series he cannot establish species with certainty; even among our own common Pentatomas, we have 5 or 6 species which are not good species at all. Mr. Howard remarked that the examination and description of such structures in very small insects like many of the Heteroptera, on account of its extreme difficulty, offers a good field for persons trained in modern morphological methods. Mr. Schwarz spoke of the comparative newness of the use of the genitalia in classifactory work, and said that it is now so general in the Coleoptera that he fears that it will be carried to the extreme; no matter how closely allied forms may seem from other characters, new species are being made on the genitalia alone. Mr. Ashmead spoke of Radowskowski's work on the Hymenoptera, as showing the importance of genital characters, sufficient even to separate families, and stated that this work had been largely confirmed by Konow and Handlirsch, and others; in his opinion this study of the genitalia is of great value, and in the Hymenoptera the males are always readily distinguished by such characters. Mr. Schwarz called attention to the fact that we have now no universal terminology for the primary sexual characters; Verhœff has proposed such a terminology for Coleoptera, and if he is correct in his estimate of the value of these characters, our conception of the families must be considerably altered; the Coccinellidæ, for example, being removed from all the rest of the Coleoptera.

Referring to a remark made by Mr. Marlatt, Dr. Gill said that the act of sexual union is not necessarily of specific value, as the domestic rooster will copulate with pheasants and guinea fowls, Mr. Marlatt said that in his words concerning interbreeding, he meant only on large scales, and in a state of nature. Animals under domestication rapidly produce variations and abnormal habits. Dr. Gill mentioned the flicker of the East and that of the West, which in intermediate regions took on intergrading forms, also interbreeding so as to create the greatest confusion, as an example of what goes on in a state of nature away from domestica-

tion. Mr. Schwarz mentioned Dr. Hagen's paper which brought together the instances of copulation between different species of insects, and in which it is shown that closely allied species rarely copulate, while there are many instances of species belonging to different families having been seen in sexual union; he further said that he had once seen two species of Lachnosterna of different groups apparently in the act of copulation, but on examination found they were both males!

DECEMBER 14, 1899.

The 147th regular meeting was held at the residence of Mr. W. H. Ashmead, 1821 Q street N. W. President Gill in the chair, and Messrs. Ashmead, Heidemann, Marlatt, Busck, Caudell, Matthis, Dyar, Howard, Johnson, and Currie, active members, and Woods, Barber, Ulke, Kotinsky, and Bayley, visitors, also present.

The officers for 1899 were re-elected for the year 1900.

—Under the head of Exhibition of Specimens and Short Notes, Mr. Ashmead showed a new genus of Braconidæ belonging to the Helconine group, from the Chatham Islands, which he proposes to call Schauinslandia.

In response to a question, Dr. Gill said that the fauna of the Chatham Islands is all Australasian but of somewhat colder character than that of New Zealand. Most of the genera are New Zealand genera, but the species are usually different.

—Mr. Heidemann read a note from Dr. Christopher Aurivilius, of Stockholm, stating that specimens which Mr. Heidemann had considered to be identical with Stal's *Aradus niger* in a paper recently read before the Society, had been compared with Stal's type and the identity established.

—Mr. Henry Ulke was invited by the Chair to make some remarks and stated that for two years he had done nothing in entomology. He had recently attended a meeting of the Philadelphia Entomological Society and mentioned the fact that he was the first member elected to that Society—forty years ago the present month. He spoke of some of his experiences in collecting in the District of Columbia some insects formerly considered exceedingly rare,

whereupon some discussion ensued between Messrs. Gill and Ulke as to the meaning of the terms "rare" and "rarity." According to Dr. Gill, these terms are comparative and depend largely upon locality, presence of food, and periodicity. He mentioned the curious history of Lepidosiren as an example and Mr. Howard suggested that the history of Margarodes was a parallel one.

—Mr. Howard mentioned finding *Hippodamia convergens* congregated together upon a chapparal bush near the top of Mount Tamalpais near San Francisco Bay, on November 15th last, many thousands of specimens being present, occurring three or four deep over every twig and branch of the bush, stating that this was the first time he had had the pleasure of observing this congregating of Coccinellidæ on mountain tops, although it had been mentioned at a previous meeting of this Society by Mr. Schwarz and at a meeting of the Biological Society by Mr. C. D. Walcott.

Mr. Ulke said that the clustering together of adult Coccinellidæ for hibernating purposes had been noticed by him in the District of Columbia.

Mr. Johnson said that he found *Megilla maculata* clustering about the bases of apple trees infested with the San Jose scale in Maryland so abundantly that he had them shovelled away with the earth so that that they should not be killed when the trees were sprayed.

—Mr. Johnson also said that he had noticed a migration of *Anosia plexippus* in the streets of Frederick, Md., in late September, in such extraordinary numbers that the colored inhabitants were excited, and came out with sticks and brooms, knocking down the butterflies. The main street for a distance of 1½ miles was full of butterflies.

Mr. Ashmead said that he noticed this species in migratory swarms in Jacksonville, Fla., the present month (December).

Mr. Howard said that he had seen the same species the present year, on August 27, starting its southward flight from the Catskill Mountains in Greene county, N. Y., the date being an earlier one than he had previously known. He said that possibly some of the same individuals which he saw August 27 in New York may have been those seen by Mr. Ashmead in December in Florida.

—Mr. Howard, referring to a previous paper read before the Society by Mr. Johnson on the subject of *Trypeta ludens*, stated that the day after he arrived in San Francisco (November 13 last), Mr. Alexander Craw, the Chief Quarantine Officer of the State Board of Horticulture of California, discovered this insect in numbers in a shipment of oranges from Acapulco, Mexico, and had the entire cargo condemned and burned, the shipping interests being informed that no more citrous fruits were to be received from the port of Acapulco. This was mentioned as a striking example of the good effects of the California quarantine system.

Mr. Marlatt suggested that until we are more thoroughly informed as to the complete life-history of this insect, we cannot say with certainty that it will ever be able to establish itself in California orange groves; that there is a period of many months in the summer when citrous trees carry no fruit, in which the insect might die out.

—Mr. Johnson said that he had bred *Aphelinus fuscipennis* in great abundance in Maryland from the San Jose scale this autumn. He is inclined to think that this parasite has become so abundant that it will be necessary to alter remedial measures against the scale. Instead of cutting down and burning trees at once, he will recommend girdling the trees and killing them and then leaving them until all parasites have had a chance to escape before they are burned. He stated that he even doubts the wisdom of winter spraying, although he is not certain as to the stage in which the parasite hibernates.

Mr. Marlatt said that he thought it likely that the parasite hibernates in the larval condition, since he has found many parasitic larvæ under scales this winter, and further stated that he considers scale parasites unusually abundant the present year.

Mr. Howard said that he had found *Aphelinus fuscipennis* hibernating in the larval stage under the scales of *A. tenebricosus*, but that while many parasitic Hymenoptera hibernate in this condition, others hibernate as adults.

Mr. Ashmead said that in his opinion the majority of parasitic Hymenoptera hibernate in the larval condition, but that during warm winters many of them frequently transform to adults well before the opening of spring.

—Mr. Johnson said that the pea louse (*Nectarophora destructor*) is still active in New Jersey, Maine, and Maryland, and spoke

at some length concerning his observations on the life-history of this insect and its natural enemies. He has reared no true parasites in Maryland, although Syrphus flies were abundant early in the season and Coccinellidæ late in the season. He stated that he is at a loss to predict with confidence concerning the abundance of this destructive pea enemy the coming season.

—Mr. Dyar then read the following paper:

LIFE HISTORY OF CALLIDAPTERYX DRYOPTERATA GRT.

By Harrison G. Dyar.

Not long ago I published a general account of the mature structure of this larva (Can. ent., xxx, 155), the first larva of the Epiplemidæ discovered in America. Last season I found the species near Washington, and was able to observe all the stages. Some unexpected points appeared. The Epiplemidæ are nearly allied to the Geometridæ, yet these larvæ would be taken for little Noctuids The eggs, too, are of the vertical type, distinctly ribbed, and not at all suggesting Geometridæ or Drepanidæ. The larvæ are exposed feeders and gregarious. Evidently the Epiplemidæ have pursued as larvæ their own course of specialization, distinct from the allied families.

Eggs. Laid in a batch of 25 or more on the back of a leaf. Conical, but with a rounded top, nearly flat; base flat; micropylar area a little elevated, circular, finely reticulated; around this is an area, covering the rest of the top surface, coarsely reticulate, the cell areas strongly sunken; sides finely ridged, 40 or over, the ridges not decreasing in number except just at the top, the spaces between divided into quadrangular areas by fine cross striæ; diameter, .5 mm. On hatching, the larvæ cut off a cap at the vertex, which is left intact with the rest of the shell. Shells very thin, so that some collapse; white.

Stage I. Head rounded, bilobed, colorless; eye black, mouth brown; width, .25 mm. Body colorless, food green. The shape is a trace flattened, both joints 11 and 12 enlarged at the sides, the anal plate small and not colored, though bristly with setæ. Cervical shield likewise rather hairy, though only the primary hairs are present. Segments 2-annulate; tubercles small, slightly conic, faintly blackish. Setæ simple, colorless, rather long. Tubercles iv and v well separated. Feet normal, perfectly equal, slender.

Stage II. Head as in the next stage, but the tubercles all distinctly dusky; width, .3 mm. The larva is squarish, a little flattened, joints 11 and 12 a little enlarged at the sides; no shields; setæ pale. The larvæ feed freely exposed and are active, running about over the stems for new leaves. At first gregarious, later scattering, but remaining on the same plant. They eat the parenchyma from below in irregular patches till stage V, then the whole leaf.

Stage III. The same, tubercles a little dusky. Width of head, .4 mm.

Stage IV. Head, .6 mm. All pale greenish yellow, translucent; tubercles colorless, setæ dusky, normal, without secondary ones. Joint 2 a little collared, 11 and 12 slightly enlarged at the sides. Tubercles conic, rather large; no shields. There is no essential change since stage I.

Stage V. Head rounded, pale brown, not shining, tubercular spots and eyes dark brown, jaws brown; width, 1 mm. Tubercles i and iii broadly black, ii, iv, and v (which are exactly in line subventrally), vi and leg plate concolorous with body. No plates nor shields, the setæ of vii distributed on the conical slender legs. At the extremities more of the tubercles are black, on joint 2 including the prespiracular, on 11 to 13 tubercle ii and on 12, iv also, which is here widely separated from v, though still in line with it. Skin transparent, blood faintly green, food dark green. Body uniform, a little flattened dorso-ventrally, feet equal. Setæ distinct, short, pale, simple.

Stage VI. Head rather square, rounded, flat before, scarcely bilobed. Very pale brownish, quite heavily spotted with blackish brown, not only on the tubercles but also in clusters at the apex of clypeus, on sides and in ill defined transverse line across upper part of clypeus; width, 1.5 mm. Body short and thick, somewhat flattened, joint 12 slightly enlarged, feet normal. Color translucent whitish, appearing slightly green from the blood, and more strongly so from the food. Tubercles i and iii and most of those at the extremities, and also a varying amount of spotting, black. The spotting begins in subdorsal marks on joints 10 to 12 and 2, and may extend to a complete subdorsal line with a broad gray shade below and a narrow blackish dorsal line, the subdorsal line very heavy on joints 11 and 12. Tubercles distinct, setæ rather coarse, pale. Shields not cornified, their tubercles separate and distinct, resembling those on the body. Feet perfectly equal.

Cocoon. A very frail, slight net of silk on the ground among leaves, etc., but not drawing the material together.

Pupa. Rounded and compact with three movable incisures; cremaster a low cone without hooks; thorax and cases robust, abdomen smaller, conic. Dark brown, shining, the incisures of abdomen and the extreme tip paler; surface slightly shagreened, not punctured. Length, 5.5 mm.*

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*Dr. T. A. Chapman, to whom the pupa was submitted without any indication of what species or family it belonged to, writes: "It is a fully obtect form and comes nearest, perhaps, to some Geometrid forms. It is structurally at the same level of evolution as the highest Noctuæ and Geometræ, that are impossible always to distinguish from one another." Dr. Chapman further expresses some doubt as to whether it is a form that "we generally include in the Macros;" but he cannot tell exactly why he thinks so. That is to say, apparently, that he thinks it essentially a Geometrid, but possessing generalized characters. This opinion is, I believe, entirely correct.

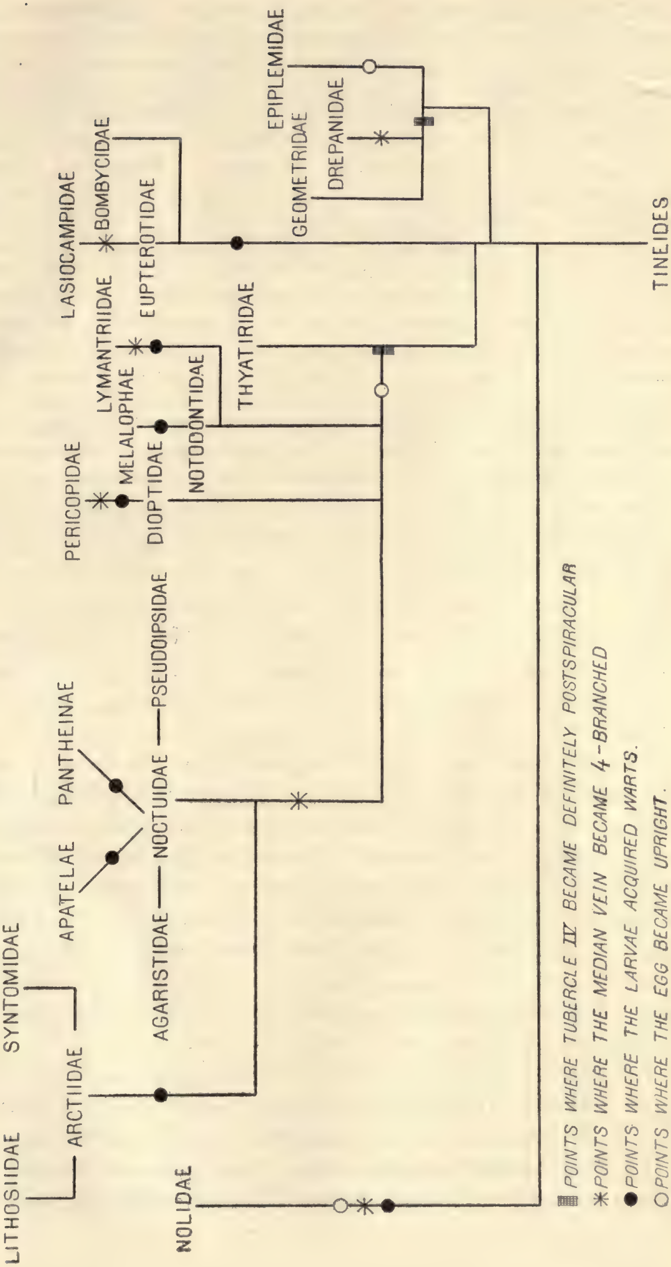
Food plant *Viburnum prunifolium.* The larvæ absolutely refused *V. lentago* and *V. dentatum.*

Found along Pimmit Run in Virginia and near Hyattsville, Maryland.

The life history of this species is very interesting in connection with Tutt's classification of Lepidoptera (J. W. Tutt, A Natural History of British Lepidoptera, 1899, p. 113). Tutt divides the order into three main lines of descent, all of which show both the generalized and specialized characters of the several stages, except the egg. The egg Tutt regards as absolute. He quotes approvingly Chapman's suggestion, who "thinks it is probable that the various forms of the upright egg had a common origin, though very low down." While not disputing Chapman's valuable generalizations, it seems scarcely more probable that the upright form of egg should have been developed but once in the evolution of the Lepidoptera than that the obtect pupa, or the four-branched median vein, or the post-spiracular position of tubercle iv should have been so developed. All of these Tutt freely derives more than once in his genealogical tree, but not so with the egg. Now, however, with regard to Callidapteryx. We have here a moth that has been classified with the Geometridæ and bears so close a relation to them that Hulst still lists it in a subfamily. Hampson separates it as an adjacent family, but only on a character of venation of seemingly secondary importance. Judging from the moth, this insect would fall in Tutt's "Geometro-Eriocranid stirps." The larva, as I have shown, possesses some peculiar generalized characters. I can hardly tell where Tutt would place it on his tree, but presumably in the stirps just mentioned. The egg, on the contrary, is upright and ribbed and would come high up in the "Noctuo-Hepialid stirps." I think that the occurrence of this generalized form connecting the Geometrids and Noctuids shows that Tutt's "stirps" are not entirely natural ones; his genealogy of the Lepidoptera has been too much influenced by Chapman's brilliant results on the egg. If these egg characters be given a less important possition, similar to that of the other characters, it is possible to recast Tutt's tree so as to bring the larvæ together more in harmony with the ideas that I have expressed. I add a chart, showing the derivation of the families of the Bombyces which is the same as that recently published (Proc. Bost. Soc. Nat. Hist., 27, 146) but modified to exclude the contradiction in egg characters to which Tutt rightly objects.

The tree is supposed to start from some generalized Tineid-like form. The Nolidæ branch off first, being really of separate origin from the Bombyces and possessing Tineid characters, yet so highly evolved as imagines as to parallel the Arctiid structure. The Geometridæ, Drepanidæ, and Epiplemidæ form a closely

GENEALOGICAL TREE OF THE BOMBYCID FAMILIES.



allied group, all having flat eggs except the Epiplemidæ, which parallel the Noctuidæ in this respect. Tutt places the Thyatiridæ on the Geometrid stem, but they seem to me to have certain Notodont and Noctuid affinities. The eggs show a certain suggestion of the vertical type and tubercle iv of the larvæ is somewhat specialized. I formerly placed the Melalophid Notodontiæ with the Eupterotidæ, but this is contradicted by the eggs. I infer from Tutt that the Eupterotid egg is of the flat type, while the Malalophid egg is of the vertical type and in Apatelodes highly specialized. I have transferred the Lymantriidæ to the Notodontian stem on the characters of the eggs, though I am not sure that this is their best place. In the Eupterotidæ, Bombycidæ, Lasiocampidæ, Melalophæ, and Lymantriidæ, all of those larvæ which have developed warts, there are three warts on the thorax above the stigmatal wart. This is a low character and shows the same type of wart formation as in those Micro families which have warts (except the Pterophoridæ and Nolidæ, which in this respect parallel the Arctian phylum, having but two such warts). The rest of the tree comprises the Arctian phylum. The only change that I have made here is to separate the group formerly called Apatelidæ into Apatelæ and Pantheinæ, separately derived from different points in the Noctuidæ.

The paper was discussed at length by Messrs. Gill, Matthis, Dyar, Ashmead, Ulke, and Howard, the discussion taking the direction of a consideration of the value of the egg stage in the classification of insects.

Mr. Ashmead, referring to the position of the spiracles, stated that this character is very valuable in the parasitic Hymenoptera. The slightest variation in the position of the spiracle and in its shape is of great importance. As to the eggs, he referred to the careful descriptions and figures given by Scudder of the eggs of butterflies and called attention to the characteristic forms of the eggs in the different groups of Heteroptera, in which order families, and in some cases genera, are readily distinguished by the egg. Natural groups will generally be found to have characteristic eggs and larvæ.

Dr. Dyar said that while Scudder deserves great credit for his egg studies, to Dr. Chapman, of England, is due the credit for the important generalization regarding upright and flat eggs.

Dr. Gill doubted the great value of the eggs in a consideration of the genealogy of insect families. It is true that the shape and

character of the egg is an expression of a morphological factor and undoubtedly the variation in eggs has been brought about by a process of natural selection since the perpetuation of the species depends to a greater or less extent upon the immunity of the egg stage from destruction by natural enemies or other causes.

The subject of insect excrements having been introduced, the discussion took somewhat the same range as in the meeting of December 3, 1896 (see Proceedings, Vol. IV, pp. 73–75).

Mr. Matthis considered that the relatively slight variation in the form of the excreta of insects was to be expected since the excreta bear no vital relation to the perpetuation of the species as do the eggs, in which there is very great variation.

Dr. Dyar, however, called attention to the larval cases of South American lepidopterous insects of the genera Pesophera and Cicinnus in which the excreta serve as a larval protection and are modified to suit the conditions—thus showing that excreta may bear a pronounced relation to the existence of the species.

Dr. Gill spoke of the work of Valenciennes and Frémy on the eggs of animals, in which the eggs of insects receive some consideration.

January 4, 1900.

The 148th regular meeting was held at the residence of Dr. Harrison G. Dyar, 1512 21st street N.W.

President Gill in the chair, and Messrs. Waite, Matthis, Marlatt, Motter, Ashmead, Caudell, Schœnborn, Busck, Chittenden, and Dyar, active members, and Kotinsky, visitor, present.

Mr. Jacob Kotinsky was duly elected to membership by the Society.

—Under the head of "Exhibition of Specimens and Short Notes," Dr. Dyar exhibited material illustrating the life-history of the very remarkable social butterfly (*Eucheira socialis* Westwood) sent to the Museum recently by Dr. Alfredo Dugès, Guanajuato, Mexico. The exhibited material consisted of two of the communal larval cases, one of which was cut open to show the mass of pupal shells contained within it, and also inflated exam-

ples of the larva, the latter never having before been described. The following description of this larva was submitted for publication:

LARVA OF EUCHEIRA SOCIALIS WESTW.

By Harrison G. Dyar.

Head prominent, rounded, somewhat higher than wide, clypeus reaching half way to vertex, the paraclypeal pieces depressed, especially in a punctiform hollow about the middle; black, shining, with numerous short white setæ; width (at hibernation) 2.5 mm. Body cylindrical, tapering a little posteriorly, joint 2 wider than the head; cervical shield and anal plate weak, but evident, black; leg shields also black. Feet normal, crotchets in a dense line on the inner half of planta, but also a secondary row of small ones on outer half. Dark purplish, approaching black, venter somewhat greenish. An obscure, diffuse, whitish stigmatal band with whitish rings about the small, black, spiracles; a broad, obscure, blackish dorsal band. Segments indistinctly 6-annulate, covered, rather thickly, with white secondary tubercles, varying somewhat in size, each with a fine white hair. The hairs are longer from the larger tubercles and all are absent on the dorsal line. Length about 25 mm. The general appearance is black, finely peppered with white. Shape as usual in Pieridæ.

Mr. Ashmead, in discussion, said he was very much interested in this note, particularly because the insect concerned is the first example of a social species in the group to which it belongs. He ventured some ideas as to the origin of the social habit, suggesting the possibility of this species being a connecting one between the butterflies and moths on account of this peculiarity. In answer to a question by Mr. Marlatt, Dr. Dyar said this species was the only social butterfly known to him. A discussion on the character of the closing nest or communal sack was participated in by Messrs. Chittenden, Gill, Dyar, Marlatt, Ashmead, Waite, Busck, and Caudell. The subject of finding a local food plant for the young of this insect now in Dr. Dyar's possession was also discussed. The native food plant in the South is a species of *Arctostaphylos*, and Mr. Waite suggested that perhaps the northern *A. uva-ursi* might supply the need.

—Mr. Busck exhibited specimens of a European moth, *Limnœcia phragmatella*, not hitherto known in the United States, which he had reared from *Typha latifolia*. He stated that this insect was a well-known European species, and also was reported from Australia. He exhibited also a slide illustrating a method which he had adopted of mounting the wings of micro-Lepidoptera in dry cells. Dr. Dyar said that the slides made by Mr. Busck in the manner described were as nearly perfect as possible and most satisfactory, and did not have the objection, which often attaches to balsam and glycerine, of obscuring many of the smaller veins. Mr. Waite said that dry mounting of Diatoms as microscope test objects had also been found to be more satisfactory than other methods, and Mr. Ashmead referred also to the loss of characters from balsam mounts of wings of Chalcids.

—Mr. Ashmead made some extended remarks on a new classification of Pompilidæ which he had recently worked out. He referred to the older views of Saussure, Fox, and Kohl, and then called attention to certain characters which he found of special service in separating the subfamilies and genera. The characters particularly pointed out were the occurrence of transverse furrows on the second abdominal segment distinguishing subfamilies, clypeal characters distinguishing others, and thoracic and antennal and eye characters still others. The use of these characters, he said, resulted in the separation of subfamilies, and enabled the making of very simple and easily understood synoptical tables. He said that he had placed the Vespidæ next to the Pompilidæ instead of near the bees, as by former authors, and pointed out that the character of the abdominal segment noted in certain subfamilies of Pomilidæ was also characteristic of the Vespidæ, which, however, were associated with the former more especially by important pronotal characters.

Mr. Marlatt pointed out the apparent anomaly of the position of certain ones near to the subfamilies of Pompilidæ of a character which was broader than the family itself, as indicated by its presence in the family Vespidæ also. Mr. Ashmead thought that the case was not anomalous, and instanced similar features in other families.

Dr. Gill suggested that this character must have been developed

independently in the families Pompilidæ and Vespidæ, and hence could not be considered affinities.

A discussion was started by Dr. Gill as to the relative value, for purposes of classification or demonstrating relationship, of structures of distinct value and use to the species as opposed to structural characters of little value and use. He held that the morphological characters exhibited by the more useful organs were least important as exhibiting relationship, for the reason that such characters were most subject to variation, whereas structures of less use and importance were necessarily less subject to variation and hence more indicative of affinities. The little value of morphological characters was illustrated by a reference to the classification of the whale as one of the fishes by the ancient authors, and of much of the old classification which was based on similarity of function rather than on true homologies.

The first paper of the evening was by Dr. Dyar, and was entitled:

ON THE DISTINCTION OF SPECIES IN THE COCHLIDIAN GENUS SIBINE.

By Harrison G. Dyar.

Some years ago Mr. H. Druce suggested to me that the North American and Mexican forms of Sibine might be of the same species, as they differed only in size. I replied that this might be so, but that the larvæ as figured by the old authors differed widely. This is a striking fact in the genus, the practical identity of the moths and the great dissimilarity of the larvæ. The two species with which I am the most familiar are the North American *Sibine stimulea* and the South American *S. trimacula*.* The larvæ differ widely as shown by published figures, as I have repeatedly verified. The moths are closely similar. I find that the shade of color is variable and the presence or absence of the small white dots on the wings is a matter of indifference in both. The specific differences narrow to two points only: (1) *S. stimulea* is generally smaller, the expanse of males being 24 to 29 mm., average 26.6 mm.; of females 31 to 38 mm., average 35.8 mm.; of *S. trimacula*, males 31 to 34 mm., average 32.5 mm.; of females 39 to 56 mm., average 46.5 mm. (2) The hind wings of *stimulea* are uniformly dark brown, while those of

* Hereinafter identified as *S. fusca*.

trimacula are lighter, almost flesh colored on the disk. However, it will be seen that the ranges in size almost overlap, while the color of the hind wings varies, and in the female the specific difference is very slight, sometimes barely appreciable, though I believe that it always does exist to some degree. Since the characters separating two well marked (as shown by the larvæ) species are so slight, it is necessary practically to place but little dependence on color and markings in this genus and rely on more subtle characters. For this purpose the male genitalia prove of value.

Unfortunately, a considerable number of species have been described and all without any reference to the genitalia. Not infrequently the descriptions have been made from a single female specimen. These it will not only be impossible to refer correctly from the lack of a male, even on examining the type, but the markings, as to what little they show, are always less definitive in the female.

Five species are represented in the collection of the National Museum. They separate on genitalic characters as follows:

Lower unpaired piece smooth.
 This piece symmetrical and flat, strap-shaped, the edges little raised .... *fusca*.
 This piece asymmetrical, tipped to the right concave.......... *modesta*.
Lower unpaired piece with angles or spines.
 This piece with an angle above on each side, that on the left the larger .... *stimulea*.
 This piece with a thorn-like point on the tip below and on the left side.......... *extensa*.
 This piece with a single spine below at tip, projecting toward the left side .... *apicalis*.

The male genitalia in this genus consist of a supra-anal plate, flattened, somewhat concave below, the tip rounded but produced in a sharp spine that is bent down at right angles; below is a long, horn-like prominence, more or less grooved above, diverging from the plate at a slight angle. The side pieces are simple, tapering, rounded, bending inward at the ends, not strongly chitinized. Beneath is a well-chitinized strap-shaped or tubular piece, or penial support, smooth, or with prominences, and usually markedly asymmetrical, being turned with its lower aspect somewhat to the left.

The supra-anal plate differs slightly in the several species. I presume that specific characters could be tortured out of it; but they would not be practically valuable. The side pieces are so nearly membranous that their form is not well fixed and is at best a very simple one. The lower piece, however, presents

some readily appreciable differences which I have used in the table just given.

Remarks on the described species of Sibine.

S. vidua Sepp. The figure represents the fore wings crossed by a bent white line, the hind wings broadly pale brown on the disk. Of *fumosa* Walker says, "fore wings with an indistinct, irregular and very slender whitish discal stripe." I presume the two refer to the same species.

Phalæna Bombyx vidua Sepp, Surin. Vlind., I, pl. 6, 1828.

Nyssia fumosa Walker, Cat. Brit. Mus., Lep., v, 1134, 1855.

S. nesea Stoll.

The figure represents a female in which a strong effort has been made to show the peculiar gloss of the wings, a general character. The subapical dots are shown as united into a short transverse line. I have no specimens showing this character. In Can. ent., xxix, 77, I identified the larva figured by Stoll (Suppl. pl. 21, fig. 3) with *nesea*, but, as I overlooked that Cramer figures three species of Sibine, it is not certain to what moth this larva should be rightly attributed.

Bombyx nesea Stoll, Pap. exot., pl. CCCV, fig. C.

S. apicalis n. sp.

I describe this as new with some hesitation. Most of my specimens came from Mr. Schaus, and as he seldom lets a new form

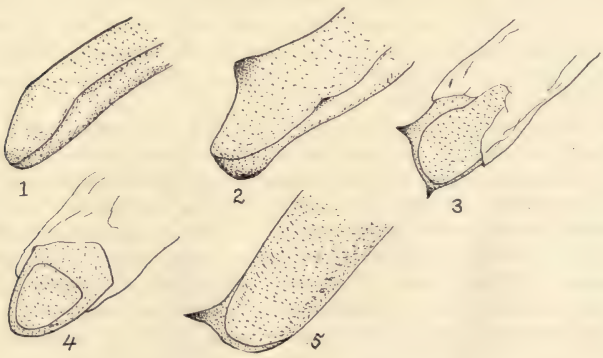


FIG. 19.—♂ Genitalia of *Sibine*: 1, *S. fusca*; 2, *S. stimulea*; 3, *S. extensa*; 4, *S. modesta*; 5, *S. apicalis*. (Original)

escape his experienced eye, it is practically certain that he named it something. However, it does not correspond to any described

species, least of all to any of Mr. Schaus' new species, of all of which I have seen cotypes. The name is a manuscript one of the late Henry Edwards.

Dark brown, the fore wings as usual, but the dots yellow, generally very large and often an additional linear yellow streak in the center of the cell in the male. Hind wings uniform chocolate brown. The species is rather small, dark, the red shades not developed, but the yellow unusually prominent. Expanse, male 28 to 32 mm., female 40 to 45 mm. Twenty-six males, three females from Mr. Schaus, presumably collected by him in Jalapa, Mexico. One male from Franck collection labelled "Mex.," not unlikely from the same catch. U. S. Nat. Mus., type No. 4432. Genitalia shown in fig. 5.

S. stimulea Clem.

Our common moth from the often described "saddle-back" caterpillar. Genitalia shown in fig. 2.

Empretia stimulea Clem, Proc. acad. nat. Sci., Phil. xii, 158, 1860.

Limacodes ephippiatus Harr., Corresp. 301, 1869.

S. fusca Stoll.

Again a single female is figured. This is rather uniform and a light brown with the three subapical dots present, large; expanse 54 mm. I have elsewhere, following Möschler, identified this with *trimacula* and *bonærensis*, and I see no reason to change. The figure might apply to one of several species, but as it can not be told which was intended, I would hereby recognize Möschler's restriction of it to the present form. Möschler gives also as a synonym ? *quercinia* Mén., but I know no description bearing the name. In *rufescens*, described from "country unknown," Walker defines a form which I can not distinguish from those *fusca* that lack the yellow dots. Genitalia fig. 1.

Bombyx fusca Stoll., Pap. exot. pl. CCCVII, fig. G, 1781.

Phalæna trimacula Sepp, Surin. Vlind. pl. 45, 1848.

Nyssia rufescens Walk, Cat. Brit Mus., Lep. v, 1138, 1855.

Streblota bonærensis Berg, An. soc. cient. Argent. v, 180, 1878.

Sibine fusca Möschler, Verhl. zool.-bot. Ges. Wien, xxvii, 671, 1883.

Sibine fusca Dyar, Can. ent., xxix, 77, 1897.

S. extensa Schaus.

Mr. Schaus describes male and female, and the latter is figured in the Biologia. From these alone I should not know what was intended, but I have specimens from Mr. Schaus, not labelled, but presumably collected by himself in Jalapa, Mexico. They agree exactly with description and figure, and the male genitalia

show a distinct species. One of my males has pale hind wings, absolutely indistinguishable from *fusca*. Genitalia fig. 3.

Sibine extensa Schaus, Journn. N. Y. ent. soc., iv, 55, 1896.

Eupalia extensa Druce, Biol. Cent Am., ii, 440, 443, 1898.

S. megasomoides Walk.

Walker describes a male from Bogota expanding 45 mm. Druce remarks that the type is in his collection and seems doubtfully distinct from *trimacula* Sepp. However, I imagined that it will prove an earlier name for *S. extensa* Schaus. *Trimacula*, as then known to Druce, included all the Mexican forms, among them *extensa*. I have not yet seen *trimacula* from Mexico. The sexual organs of the type of *megasomoides* should be examined.

Eupalia megasomoides Walk., Cat. Brit. Mus., xxxv, 1928, 1866.

S. plora Schaus.

Mr. Schaus describes a form close to what I identify as *modesta* below, but apparently smaller. There is nothing in his description either, to exclude *extensa* Schaus or *megasomoides* Walk. I had his typical male specimen before me, but did not examine the genitalia. Perhaps Mr. Schaus, owning the specimen himself, will feel at liberty to do so.

Sibine plora Schaus, Journ. N. Y. ent. soc., iv, 55, 1896.

S. modesta Cram.

Kirby includes this species under Elysius, an Arctian genus. But this is one of his less fortunate guesses. The figure obviously represents a Sibine. It is a female, dark brown with a general purplish cast, the red apical stain well marked and no white dots. Expanse about 54 mm. I identify with this five specimens received from E. Wittkugel, San Pedro Sula, Honduras. The spots are greatly reduced, nearly absent, and the whole insect has a purplish cast, reminiscent of Cramer's figure. Mr. Schaus loaned me a male which he had identified as *modesta* and which may not be the same species which I here so identify. But as he has not published anything definite on the subject to my knowledge, I feel free to restrict Cramer's indefinite term as seems to me most probably correct. *Affinis* Möschl., described from one female, is doubtless synonymous. I have a female specimen from Paramba, Ecuador, which agrees entirely with Möschler's description and I see no reason to seperate it from *modesta*. Genitalia shown in fig. 4.

Bombyx modesta Cram., Pap. exot., pl. CXV, fig. C, 1779.

Sibine affinis Möschl., Verhl. zool.-bot. ges. Wien, xxxii, 353, 1883.

Note—Of the other species described as or referred to Sibine, *argentata* Walk. and *argentea* Druce belong to Miresa; *auro-*

macula Schaus I have made the type of Episibine; *dicolon* Sepp, *plugma* Sepp, *norba* Druce, and *copac* Schaus belong to Euclea; *sulla* Schaus becomes the type of Protalima; *determinata* Walk., *rufa* Butl., and *varia* Walk. are clearly not Sibine; the latter probably is Euclea, and others will have to be examined.

In discussion Mr. Ashmead suggested the possibility of splitting the genus into two genera by reason of the marked difference exhibited by the larvæ, suggesting that careful study of the genitalia would demonstrate corresponding generic differences in the adult insects. He illustrated this by reference to Hymenoptera, and stated that the chief objection to the use of genitalia as a means of separation was the extraordinary difficulty of making the studies and the vast amount of time necessary for such work.

Dr. Dyar then presented a second paper, entitled:

A DIVISION OF THE GENUS SPHINGICAMPA WALSH WITH REMARKS ON THE LARVÆ.

By Harrison G. Dyar.

Our species of Sphingicampa are obviously separable into two groups or genera, in one of which the antennæ of the female are pectinated, in the other simple. The first group contains *bicolor* Harr., which is the type of Sphingicampa, the second the remaining species. The types of the other genera of the Citheroniidæ have been specified by Kirby. Adelocephala H. S. has type *cadmus* and Orthorene Boisd. the same. Boisduval states that both sexes have the antennæ pectinated and therefore these names cannot be applied to the second group. There remains only the genus Sissphinx Hübn. (not Sissisphinx, as written by Kirby), type *molina*. This has the antennæ of the female simple and, though the male frequently has the outline of the wings waved and the larva is unusually modified, we may refer our species to this genus, rather than create a new one on slight characters.

Genus *Adelocephala* H.-S.

(=Sphingicampa Walsh, =Orthorene Boisd.)

A. cadmus H.-S. According to Boisduval (Ann. ent. soc. Belg., xv, 82, 1872), the female has the antennæ pectinated. The larva has the subdorsal spines equal on all the segments. Boisduval says: "Le premier anneau garni de pointes acérées de longueur médiocre, les deux anneaux suivants munis de longues

épines dentelées et les autres hérissés de pointes longues, chochues, recourbées en arrière et de longueur egale."

A. bicolor Harr. The larva has been fully described by Walsh (Proc. Bost. soc. nat. hist., ix, 292, 1863, and Proc. ent. soc. Phil., iii, 425, 1864), Jewett (Pap. ii, 138 and 144, 1882) and Packard (Proc. Am. phil. soc., xxx, 137, 1893) and referred to without name by Siewers (Can. ent. x, 85, 1878). It varies remarkably in the subdorsal silver horns which are usually unequally developed on successive segments, but occasionally revert to the generalized condition and are equal on all segments.

Genus *Syssphinx* Hübn.

(=Psephopæctes G. & R., =Ceroderes Boisd.)

S. molina Stoll. This larva is the most highly modified of any of the group. According to the figures of Stoll (Suppl. Cram. Pap. exot. pl. 22 fig. 4) and Sepp (Surin. Vlind. iii, pl. 118) it is humped up at joints 5 and 12 in a peculiar attitude and the horns are nearly absent. The subdorsal thoracic pairs are short, wholly or partly red, and the single dorsal one on joint 12 is reduced to a granule. Otherwise the larva is nearly smooth, though the dorsal surface of joints 12 and 13, which forms an oblique plane, is roughened with granules.

Boisduval remarks (Ann. ent. soc. Belg., xv, 82, 1872) that a specimen before him had the horns long, black, and recurved; but possibly this is another species distinct from *molina*. It is not stated that the larvæ were bred.

S. bisecta Lint. Jewett remarks (Pap. ii, 40, note) that a larva obtained by bush beating in company with *A. bicolor* larvæ had no silver horns, but only the rudiments on one segment. Otherwise it closely resembled *bicolor* and was supposed to be a larval variation till it was bred.

S. heiligbrodti Harv. An unbred larva, which I am inclined to refer to this species, was received from San Antonio, Texas. Another specimen is in the collection of the National Museum, received from Dr. Dugès in Mexico.

Head conic, somewhat triangular, but flat at the vertex, flattened also before and at the sides, the clypeus small, shield-shaped, both it and the paraclypeal pieces coarsely roughened, the head surface punctate-shagreened; green, a white stripe from before ocelli to vertex of each lobe, edged before and behind by a darker green than the ground color; antennæ and labrum white; width 5 mm. Body cylindrical, feet large with coarsely granular shields; the anal shields large, triangular. Joint 2 contractile, cervical shield small, smooth, weak, a row of large, conic granules on the anterior edge with patches of smaller ones below on the sides. Subdorsal horns of meso- and metathorax (tubercles ia+ib and iia+iib) long, recurved, slightly dentate with

small granules; single horn of joint 12 stouter and with larger pointed granules. Subdorsally and laterally on joints 5 to 12 a stout, pointed, recurved, short horn, silvery white without, red within, less than one-third as long as the thoracic horns; a similar, smaller pair on joints 12 and 13 anteriorly; a small, scarcely silvery horn subventrally on joints 5 to 12. Dorsally a few large, sparse granules, principally in one transverse row posteriorly on each segment; many granules subventrally, more pointed than the dorsal ones. Anal plate semi-elliptical, not furcate behind (as in *bicolor*), densely granular around the margin with a double or triple row of white granules, the two most posterior of which are large and erect; centrally on the plate are about seven rather remote granules. The granules are all larger and fewer than in *A. bicolor*. Color green, except the silvery horns and white granules, the thoracic horns tinged with brown. A broad, white, substigmatal band on joints 5 to 12, edged with dark red above and yellow below.

S. anthonilis H.-S. Boisduval remarks: "La chenille est entièrement noire et pourvue de longues pointes d'egale longueur toutes dirigées en arrière, comme celles d'un hérisson lorsqu'il marche. Les épines de la colerette sont bien prononcées mais beaucoup plus courtes que les autres." Evidently a generalized form.

S. brevis Walk. Boisduval remarks: "La chenille est fort jolie; elle est d'un vert jaune avec des pointes couleur d'or très brillantes de longueur médiocre recourbées et dirigées en arrière, dont celles du second et du troisième anneau sont dentelées ainsi que celles qui se trouve au milieu de l'avant dernier, laquelle a un peu la forme d'une queue recourbée. La colerette n'a pas de pointes proprement dites; elles sont remplacées par les petits tubercules coniques." It is a pity that Boisduval's manuscript name *chrysacantha* could not have been used for this species.

S. leucantha Boisd. The author says: "Les chenilles . . . paraissent être vertes; elles sont munies de pointes blanchâtres à sommet noir, de longueur egale, dirigées en arrière, dont celles du second et du troisième anneau, ainsi que celle qui se trouve au milieu de l'avant dernier sont un peu dentelées et un peu plus grosses. La colerette est garnie d'une rangée de petites pointes assez saillantes."

S. argyracantha Boisd. Said to be a variety of *S. crocata* Boisd., described on the same page. Two larvæ bearing this name from Mr. Ruscheweyh, Buenos Aires, Argentina, agree in general with Boisduval's brief description except that the long thoracic and anal horns appear to have been green, not silvery, a point which Boisduval omits to mention. The head is conic triangular, flat before, densely granular shagreened, the paraclypeal pieces nearly obliterated; two narrow, blackish brown lines on

each lobe from ocelli and from before antennæ to vertex; width, 4 mm. Doubly paired horns on joints 3 and 4 and single dorsal one on joint 12 long, recurved, with slight granules toward base, larger on the anal horn. The upright subdorsal, silver thorns are nearly half as long as the thoracic horns, subequal. Silvery granules large and sparse, only about 10 in the row on anterior edge of cervical shield and rim of anal plate; of the latter, the two behind are erect and rather remote. The center of the shield has about 5 granules. Coloration destroyed in the specimens.

S. subangulata H.–S. Concerning this larva Boisduval was only able to state that "Les épines ou pointes sont noires, assez longues et dentelées sou le second et le troisième anneau; la colerette est aussi garnie de pointes roides."

The curious Notodontian genus Crinodes H. S. (=Astylis Boisd.), the larvæ of which are covered with long, recurved black horns so that Boisduval placed them in the Citheroniidæ, needs further investigation.

General discussion relating particularly to the larvæ of these moths followed, which was participated in by Messrs. Chittenden, Gill, Ashmead, and others, Mr. Ashmead stating that the larva, when first received by the Museum, was successfully photographed by Mr. Smiley. A discussion followed on the popular names assigned to some of these larvæ, and particularly to the larva of *Citheronia regalis*.

A paper sent for reading before the Society by Prof. J. M. Aldrich, of the University of Idaho, was read by the Secretary. It was entitled "Sketch of the Recent Flea War in Germany," and gave in a humorous vein an account of a controversy relative to certain Diptera supposed to furnish a connecting link between the fleas and the Phoridæ. The outcome of the whole matter is the description of several new species of Phoridæ and Borboridæ, and as none of the new forms sustain any close relationship to the fleas, the origin of the latter was left as much in the dark as ever.

February 8, 1900.

The 149th regular meeting was held at the residence of Mr. Schwarz, 230 N. J. ave. N.W. President Gill in the chair and

Messrs. Benton, Schwarz, Currie, Kotinsky, Pratt, Busck, Caudell, Morris, Pollard, Chapin, Ashmead, Stiles, Patten, Howard, Heidemann, and Mathis, active members, present.

Under the head of Exhibition of specimens, Mr. Ashmead exhibited one specimen each of *Bombus carbonarius*, *Elema nigrita*, and *Centris nigerrima*, all from a single locality in Chile and all three so nearly alike in general appearance as to be calculated to deceive any but a specialist. He said that it seemed like a case of mimicry, but agreed to the suggestion made by Messrs. Gill and Howard that as all were Aculeate Hymenoptera from the same locality nothing was to be gained by mimicry, and the similarity of appearance was doubtless due to similar environment and conditions of life.

—Mr Schwarz mentioned the specimens of the Scolytid beetle, *Cactopinus hubbardi*, which he had shown at a meeting of the Society a year ago as exhibiting an interesting instance of longevity, and stated that the piece of giant cactus containing these insects was examined by Prof. Hopkins and himself on the 31st January, 1900, and the insects were still found to be alive after an existence of 4 years in a glass jar in his room. Some remarks were made on the subject of longevity in insects, practically duplicating a similar discussion already recorded.

—Dr Stiles, who had recently returned from a two-years' absence in Germany, stated that he was the bearer of greetings to members of the Society from a corresponding member, Dr. R. Heymons, of Berlin, and also from Drs. Karsch, Stadelmann, Carus, Dohrn, and others.

—Mr. Schwarz remarked upon an interesting observation made by the late Mr. Hubbard regarding the breeding habits of two species of Nitidulid beetles (*Carpophilus yuccæ* Crotch and *C. lacertosus* Murr.?) in the mountainous regions of southern Arizona. On the surface of the leaves of *Yucca macrocarpa* brown spots could occasionally be seen, but only on such plants which had flowered the previous season, and only on the leaves nearest to the old flower stem. These spots, which occur always near the base of the leaves, showed an extremely minute hole at the middle, and this led into an irregular and rather capacious chamber excavated within the fibrous interior of the leaf. In each chamber from 5 to 8 specimens of the Carpophilus were met, and it was

evident that the beetles had undergone their development within this chamber, which must have been excavated by the larvæ. The brown spot was regarded by Mr. Hubbard as a fungus, but whether the latter had made its appearance on account of the workings of the Carpophilus larva beneath the epidermis of the leaf, or whether the parent beetle carried the spores of the fungus from plant to plant, was left undecided. An undescribed species of Hesperobænus lives as an inquiline or parasite in the Carpophilus burrows.

—Mr. Schwarz spoke of the so-called "saw-dust" ejected from the burrows of wood-boring insects, and raised the question as to whether this is really excrement or comminuted wood. He showed a sample of the dust ejected from the burrow of a Sinoxylon (Bostrichidæ) inhabiting mesquite which was as fine as flour. He referred to the paper by Mr. A. F. Burgess in Bulletin 20 of the Division of Entomology on the injury to tan bark by *Dinoderus substriatus* in reducing the hemlock bark to powder, and stated that he was not sure that this reduction did not improve the tanning quality of the bark, referring to the superior quality for medicinal purposes of Jalap after Scolytid (*Cryphalus jalapæ*) attack as a suggestive parallel case. He stated that Mr. Hubbard had given some of this fine powder of the mesquite to a jeweler in order to test its value for polishing jewelry, and that he was under the impression that the experiment was a success.

Mr. Pratt stated that Mr. Hubbard had at one time a quart of the powder made by some species of Lyctus in bamboo which he stated he intended to use for polishing.

—Mr. Ashmead presented the first formal communication of the evening, on the results of a classification of the Superfamily Ichneumonoidea. He exhibited his extensive manuscripts, now practically completed, in which he has prepared a classification of the Ichneumonoidea of the world.* He has divided the group into six families, and of the more than 1,200 genera which have been named he has tabulated 1,069 valid ones, the others being synonyms or not recognized. He gave a general summary of the scope of the paper, mentioning some of the subfamilies of the principal families. In response to a question by Dr. Gill he

*This work is published in Bulletin XXIII, U. S. Nat. Museum, 1900.

stated that about 12,000 species of Ichneumonoids have been described.

Dr. Gill called attention to the fact that not only here but in Coleoptera the average seems to be about 10 species to the genus, whereas in vertebrates it is much less; in birds, for example, the average being about 4 species to the genus.

Mr. Howard congratulated Mr. Ashmead upon the completion of this monumental work and stated that Mr. Ashmead's labors, not only in this superfamily, but in the whole order Hymenoptera, were of great importance and showed rare ability and that they shed lustre not only on the Society, but upon American entomology.

Dr. Stiles said that in his opinion a work of this kind ought to be accepted as a basis for a Doctor's Degree in any university.

—The second communication was by Mr. Howard and was entitled "Miscellaneous Notes." The speaker presented certain correspondence recently received which indicated the possibility that a young larva of *Gastrophilus equi* had been voided with the excrement of a 13-year-old boy in Illinois. He stated, however, that the case was still under investigation and that he had not yet arrived at a definite opinion as to the accuracy of the observation. The case was an interesting one, since this Œstrid is a stomach inhabitant of the horse and the genus is not mentioned in the recorded cases of true internal myiasis. Some discussion followed on the subject of myiasis and pseudo-parasitism, in which Messrs. Stiles, Gill, Ashmead, Schwarz, Pratt, and Howard took part.

Mr. Howard having referred to the undoubted voiding of Drosophila larvæ in the excrement of human beings, Mr. Schwarz stated that owing to the abundance of these larvæ in over-ripe fruit almost every one must eat many of them in the course of a fruit season.

Mr. Pratt said that in the course of his work upon the insect fauna of human excrement, which he had been carrying on for Mr. Howard, he had reared Drosophila from the excrement and that there was a possibility that the larvæ had been originally voided, although the flies themselves are attracted to the excrement.

Mr. Ashmead referred to the eating of cheese maggots by per-

sons who are fond of old cheese, and Mr. Howard said that Piophila larvæ had been voided in living condition in the excrement of such persons.

Mr. Pratt added that in the course of the work above mentioned he had captured Piophila upon human excrement.

The second note presented by Mr. Howard referred to the determination of certain insects which have been sent him from Hamburg and which have been taken in American fruit barrels. He read a long list of species collected under these conditions in Germany and sent to his office for determination. He showed that a majority of the forms were cosmopolitan, occurring both in Europe and America. Others were European species which had been attracted to the fruit after landing, while a comparatively insignificant portion were American insects. Almost none of these, however, were of an injurious character, many being distinctly beneficial predatory species, while there was practically nothing which offered the slightest danger to German agriculture. He went somewhat into detail as to these matters and showed that while any alarm which might be felt in Germany was poorly founded, the sendings indicated the desirability of the shipment of American fruit in cleaner condition and the need of better packing.

The paper was discussed at length by Dr. Stiles, who reviewed the commercial relations between Germany and the United States in detail.

March 8, 1900.

The 150th regular meeting was held at the residence of Mr. C. L. Pollard, 1854 Fifth street N.W. Present: Messrs. Ashmead, Pollard, Benton, Caudell, Currie, Morris, Kotinsky, Chapin, and Howard, active members; Lugger, corresponding member, and Collins and Maxon, visitors. In the absence of the President and Vice-President, Mr. Ashmead was made chairman.

On motion, the Wisconsin Natural History Society was placed on the exchange list, and Prof. W. P. Hay, of Howard University, was elected an active member.

Under the head of Short Notes and Exhibition of Specimens,

Mr. Lugger expressed his pleasure at being once more in Washington, which he said was the Mecca of American entomologists.

—Messrs. Chapin and Morris discussed the time required for drying the wings of the large Bombycids.

—Mr. Kotinsky, referring to a remark made by Professor Gill at a previous meeting, in which, speaking of the bower bird, he had asked whether anything of a similar nature occurred among the insects showing an æsthetic taste, called attention to a note by Kirby in "Marvels in Ant Life," in which is mentioned the observations of Jenner Weir at Pisa on an ant which made a mound of earth over the nest entrances, collecting there such numbers of empty snail shells that they could be picked up by handfuls.

Mr. Lugger referred to the helix-like case of certain Trichoptera, and to the fact that the cases of many of the larvæ of this group of insects are very beautiful and exhibit an apparent æsthetic taste.

—Mr. Ashmead showed three African Hymenoptera, two of which have been collected by Mr. Currie in Liberia. He discussed the validity of *Odontobracon* of Cameron as a genus distinct from Syngaster of Brullé, showing a specimen of this genus. The second specimen represented a new genus of Braconidæ, with deeply emarginate eyes; and the third another Braconid, representing a new genus of Macrocentrinæ. He also showed a specimen of Kriechbaumer's genus Dicranoneura belonging to the same group, and he expressed himself as being gratified to find so many recently described African genera in the National collection.

—In the absence of Mr. Marlatt, the Secretary read the first paper of the evening, which was prepared by the absentee, and was entitled "The European Fruit Diaspis." Discussion ensued by Messrs. Ashmead, Pollard, and Howard as to the synonymical questions involved.

—The second paper was by Mr. Currie, and was entitled:

A DWARF ANT-LION FLY.

By Rolla P. Currie.

Dr. Hermann Hagen, in his "Synopsis of the Neuroptera of North America," described a new species of Myrmeleonidæ under the name *Myrmeleon pygmæus*. The measurements given for

the single specimen, collected in Mexico, show it to be the smallest ant-lion fly recorded up to that time. As is well known, however, there is considerable individual variation in size in some species of these insects, and I have recently studied specimens in the National Museum collection which appear to belong to *pygmæus*, although considerably larger than the type, and as large, or larger, than some other forms recently described.*

In his "Stray Notes on Myrmeleonidæ," Part 3, † Dr. Hagen again alludes to this species, putting it, with a query, in the genus Maracanda of MacLachlan, a genus characterized, as is this species, by absence of tibial spurs. As pointed out in that article, it differs considerably from the other species of Maracanda, and, after examining specimens, I have decided to erect for it a new genus.

MARACANDULA, new genus.

Tibæ without spurs. Antennæ short, almost capitate, slender basally. Palpi short. Basal joint of tarsi as long, or nearly as long, as the three following joints. Wings short, their apices strongly dilated, very obtusely pointed; venation simple; radial sector with five or six posterior forks.

Type.—Myrmeleon pygmæus Hagen.

As the original description is somewhat meagre, it may be well to redescribe the species from the material now available.

MARACANDULA PYGMÆA (Hagen).

M. [*yrmeleon*] *pygmæus* Hagen, Syn. Neur. N. Am., July, 1861, p. 231.

Maracanda ? pygmæa Hag., Can. Ent., XIX, No. 11, November, 1887, p. 216.

Male.—Length, 20 mm.; alar expanse, 38 mm.; greatest width of anterior wing, 5.6 mm.; antenna, 2.4 mm. Fuscous and luteous. Pubescence white and black, rather long and sparse.

Face flat; upper part, between and surrounding antennæ, piceous, forming a transverse band. Labrum narrower than clypeus, rather long, free edge rounded and *not* straight or emarginate in front. Palpi luteous, tinged with piceous, especially dark on apical joints; last joint of maxillary palpi narrowed towards tip, of the labial, slender fusiform. Labium, palpigers, mentum and throat, tinged with piceous. Antennæ about as long as the distance between their base and articulation of anterior wing, fuscous; several joints before the club, and a portion of the club itself, pale; two basal joints piceous, their apices narrowly, and articulation with the head, luteous. Vertex strongly elevated; the sides, viewed from in

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* *Brachynemurus pallidus* Banks; *B. pusillus* Currie.

† *Canadian Entomologist*, Vol. XIX, 1887, p. 216.

front, nearly vertical; longitudinal furrow marked by a fine fuscous line; above with a large fuscous spot on each side near occiput.

Pronotum as broad as long, somewhat narrowed in front; anterior angles rounded, front margin nearly straight; an interrupted, obscure, pale fuscous line running lengthwise in the middle, and a large, irregular, darker spot each side at the transverse furrow; sides beneath bordered with fuscous. Meso- and meta-notum fuscous, varied with luteous, especially on lateral and posterior lobes, the pattern indistinct. Sides and sterna fuscous and luteous in about equal proportions.

Abdomen pale fuscous below, luteous above; segment 2 and apical half of the following segments fuscous dorsally; the luteous portions of dorsum have indications of a longitudinal median dark line. Appendages extremely short (hardly apparent to the naked eye), blunt, divaricate, luteous, very similar in shape to those of *Brachynemurus pusillus* Currie.*

Legs with long, sparse, black and white spines on tibiæ; coxæ, luteous, marked with fuscous; femora tinged with the same color; apices of tibiæ, a ring near their base, and tips of tarsal articles, dark; claws about half the length of last tarsal joint, rufo-piceous.

Wings a little longer than abdomen, hyaline, the posterior margins slightly incurved apically. Pterostigma white, brown interiorly, a few intercostals forked before it. Veins with long, sparse, black and white hairs; longitudinals pale luteous; with frequent fuscous interruptions; transversals yellow, fuscous or bi-colored. Anterior wings with a series of pale brownish cloudings between subcosta and radius; another series between median and submedian veins, a larger spot at their apical terminus and another at juncture of anal vein and posterior cubital fork; posterior wings narrower and a little shorter than anterior, unspotted, except for a dark clouding at end of mediana. Membranule of posterior wings provided with a tuberculiform process which is tipped with a brush of hairs or bristles.

Female.—Abdomen one-fourth shorter than in the male; other measurements about the same. Tip of abdomen dark, spinous; the usual short, hairy, cylindrical appendages below. Wings a little more rounded at tips, the posteriors without tuberculiform process from membranule.

Described from three specimens, one male and two females, collected in Madera Canyon, Santa Rita Mts., Arizona, June 16 and 17, 1898, by Mr. E. A. Schwarz. Two more specimens, females, collected by Dr. R E. Kunze, at Phœnix, Arizona, May 16 and June 7, 1897, and kindly loaned me by Mr. C. C. Adams, are smaller than the others, with wings more rounded at tips, posterior margins not perceptibly incurved. They expand 32 to 33 mm. This species superficially resembles *Brachynemurus sackeni* in the markings of wings and abdomen.

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*Can. Ent., XXXI, No. 12, December, 1899, p. 363.

Mr. Ashmead discussed briefly the characters used by Mr. Currie and said that he considered him perfectly justified in the founding of the new genus.

Some discussion ensued between Messrs. Lugger and Ashmead on the habits of the Myrmeleonidæ and also on the influence of larval food on the size of the adult. Mr. Lugger said that starved ant-lions could be reduced one-half in size, and Mr. Ashmead stated that in the Hymenoptera there was the greatest variation in the size of individuals, due to food supply. He said that he had seen specimens of *Pimpla inquisitor* which were three or four times as large as other specimens of the same species.

Mr. Ashmead said that he had found eggs on a coarse grass in Florida which looked like Pentatomid eggs, and that he had reared from them long-jawed larvæ which he took to belong to the Myrmeleonidæ; he thought that in Florida the larval growth occupied not more than five or six weeks. Mr. Lugger in Minnesota had kept the larvæ for three or more months before transformation. Mr. Lugger further said that if anyone wished to study the Myrmeleonidæ he should visit Chinquateague Island, off the coast of Virginia; he had seen there a great abundance of specimens of large ant-lion flies.

Mr. Benton remarked on the difference in size in bees depending upon the larval food; and Mr. Curry referred to the increase in the numbers of the genera of the Myrmeleonidæ since the publication of Hagen's Synopsis of the Neuroptera of North America.

Mr. Lugger referred to a curious case in which a few loads of sand had been deposited in a perfectly sandless post-oak region in Minnesota. The next year this little sand heap was covered with the pits of ant-lion larvæ, when, so far as he knew, the nearest sand occurring naturally was 12 to 15 miles away.

—The third paper was by Mr. Benton and was entitled "Notes on Carniolan Bees, and a Peculiar Belief among Bee-keepers in Carniola, Austria, regarding the Drone Fly, *Eristalis tenax*." He described at some length the topography of Carniola and his four years' stay in that country in the early '80's, and the peculiarities of the Carniolan race of bees. He called special attention to the fact that owing to the introduction of Italian bees in the southern portion of the country the Carniolan

bees have become somewhat yellow on the abdomen, whereas the pure strain is gray. This fact is attributed by the natives to cross breeding of the bees with the drone fly, *Eristalis tenax*.

APRIL 12, 1900.

The 151st regular meeting was held at the residence of Dr. L. O. Howard, 1336 30th street. President Dr. Gill in the chair, and Messrs. Mathis, Chapin, Kotinsky, Busck, Dyar, Morris, Pollard, Ashmead, Vaughan, Howard, Heidemann, Marlatt, and Hay, active members, and Professor B. W. Evermann, visitor, also present.

—The Corresponding Secretary announced the death of Mr. A. Bolter, of Chicago, Ill., Corresponding member of the Society, which took place on March 18, 1900.

Under the head of Short Notes and Exhibition of Specimens, Messrs. Morris, Chapin, Ashmead, Dyar, and Mathis discussed, briefly, the crippling or non-expanding of wings of *Attacus polyphemus* in a dry atmosphere or in a confined space.

—Mr. Heidemann showed a new species of the Tingitid genus Proxius, collected by Messrs. Hubbard and Schwarz at Tampa, Fla. This is the first specimen of this genus found in the United States. It is probably identical with one of the forms described by Champion from Central America. Mr. Ashmead said that he had taken several Mexican beetles on Metacumbe Key, Fla., and Dr. Dyar remarked that the insect fauna of the east coast of southern Florida is West Indian, and that of the west coast is more Mexican.

—Mr. Busck showed a handsome Tineine collected in Florida by Dr. Dyar, the larva of which constructs a 7-chambered case on palmetto leaves. He proposed to erect a new genus for this form and will call it Homaledra. It belongs to the Elachistidæ.

—Dr. Dyar spoke of the curious change in the color of the head of the larva of a Syntomid in which the head is colorless until the 7th stage, when a strong U-shaped black mark appears, which, however, is again lost in the final stage. This instance is unique in his experience.

—Dr. Howard asked the members of the Society to make observations during the coming summer on the resting position of mosquitoes of the genera Anopheles and Culex with a view to attempting to substantiate the observation made by Ross in Sierra Leone that Culex resting on a perpendicular wall holds its body parallel to the wall, while Anopheles holds its body nearly at right angles.

—Dr. Dyar presented the following paper:

A REMARKABLE SPHINX LARVA (LOPHOSTETHUS DUMOLINII LATR.)

By Harrison G. Dyar.

The supposed near relationship of the Saturniidæ and the Sphingidæ has been regarded as strongly indicated by the African spined Sphinx (*Lophostethus dumolinii*) as well as, to a less degree, by the American horned Sphinx (*Ceratomia amyntor*). I have been able to show that the mature armature of the horned Sphinx is secondary, having no relation to the primary tubercles, and hence valueless as an indication of relationship. In this Sphinx the horns and roughly toothed lines are a hypertrophy of the secondary granules, occurring in the position of the ordinary Sphinx markings, converting these markings into structural elements, all apparently in adaptation to the rough and toothed leaves of the elm, its food plant.

In the African spined Sphinx, however, we have long spines, occurring, apparently, in the position of the primary tubercles. The published accounts fail to give the exact location of these spines, so that, without seeing this larva, I felt myself to be at a disadvantage in the discussion of this general subject. Very recently, however, I have been so fortunate as to secure a fine mature larva of *Lophostethus dumolinii*, received through the kindness of Mr. C. P. Lounsbury, now of Cape Town, Cape Colony, collected by Mr. J. F. Queckett, of Durban, Natal.

The insect has a remarkably Ceratocampid-like appearance, suggesting, except for the nearly equal length of all the spines, the American *Citheronia regalis*. But let us consider the structure more in detail.

The annulets.

The segments are divided faintly into eight annulets, as in the Sphingidæ.

The secondary hairs.

These are degenerate and nearly obsolete, though, with a lens, their numerous, minute tubercles may readily be detected.

The spines.

These are long, stiff, black thorns, occurring on all the segments, though but weakly developed on the prothorax and 9th abdominal, none on the 10th abdominal segment. The subventral ones are shorter than the subdorsal ones, and the upper spine on meso- and metathorax as well as the unpaired median spine on the eighth abdominal segment are slightly longer than the other subdorsals and shortly forked at tip. The spines are smooth in the case of the shorter ones; the longer ones have from one to six short side thorns or branches.

The number of the spines.

On the prothorax, one each side, above the base of the foot; on meso- and metathorax four on each side; on the first to sixth abdominal segments, five; on the seventh segment, four; on the eighth segment, one on the dorsal line and three on each side; on the ninth segment, two; on the tenth segment (anal plates) no true spines, but a lump on each side of the middle of suranal plate. Two to three short spines on the leg-plates of the third to sixth abdominal segments.

The position of the spines.

On the pedal abdominal segments the position is: First spine subdorsally on third annulet; second spine laterally on fourth annulet; third spine substigmatally on second annulet; fourth spine upper-subventrally on fourth annulet; fifth spine lower subventrally above base of foot (sixth annulet). On the first and second abdominal segments the subventral spines are more remote and more in line transversely, being both on the fifth annulet. On the sixth and seventh segments the fifth spine is missing. On the ninth segment the upper spine is lateral, the lower pedal, being in front of the anal foot. On the thorax the first spine is subdorsal, the second lateral, the third substigmatal and a little anterior, the fourth subventral.

The homology of the spines.

The position of these spines seems to indicate that they represent the primary tubercles. Tubercle ii is not represented, and there is an extra subventral spine on the third to sixth abdominal segments; otherwise the position is exactly that of the setæ in stage I of any Sphinx. Therefore, on the pedal abdominal segments the first spine corresponds to tubercle i; the second to tubercle iii; the third to tubercle v; the fourth to tubercle iv; the fifth to tubercle vi (subprimary). On the thorax, the first spine corresponds to tubercles ia + ib as proved by the cleft tip; the second to tubercle iia, iib being lost, or to iia + iib, the cleft tip

being lost—stage I would decide; the third to tubercle iv; the fourth to tubercle vi. The first stage is needed to confirm these homologies.

Coloration.

This is, in effect, not Sphingid, but Ceratocampid. The head and cervical shield are conspicuously striped with black; the anal plates are red with black borders; the body is green, the spines black with yellow bases, the foot shields black. A white or yellow bar extends between the second and third spines on the first to seventh abdominal segments.

Conclusion.

The larva of *Lophostethus dumolinii* is a true Sphinx, not more nearly related to the Ceratocampids than any other Sphinx, since it possesses true Sphingid tubercles, iv above v and before the spiracle, not united with v as in all the Saturnian phylum. Functionally, indeed, it is a Saturnian like the African Saturnians with thorn-like tubercles; but the character is evidently adaptational, an irregular hypertrophy of the tubercles superimposed on the phylogenetic characters of the Sphingidæ.

With the exception of tubercle ii on the abdomen, vii on 7th and 8th abdominal segments and viii on all the apodal segments, all the primary tubercles are represented by spines. I am inclined to refer the fifth spine of first and second abdominal segments to tubercle vii rather than to vi. Stage I, when at hand, will decide the point.

As to the subprimary tubercles, there is no indication of their presence on the thorax, and on the abdomen tubercle vi only on second to fourth segments. I am not yet fully clear as to the significance of this unexpected condition. Apparently the Sphingidæ are descended from forms possessing the subprimary tubercles, though the character holds but weakly in the group at present. On the other hand the apparent weakness of the character may be due to the irregularity of the spine formation which has affected only a part of the tubercles.

A full account of all stages of this curious larva is much to be desired.

The paper excited much interest and a number of questions were asked as to the important differences between the larvæ of Ceratocampidæ and Sphingidæ and as to the value of certain larval characters. Among other questions, Mr. Ashmead inquired as to the exact characters separating Lepidopterous larvæ from Tenthredinid larvæ, stating that he understood that the absence of

hooks on the abdominal legs was occasionally noted with Lepidopterous larvæ. Dr. Dyar replied that, so far, the only constant character known to him was the possession of only a single ocellus on each side of the head with Tenthredinid larvæ, whereas with Lepidopterous larvæ they are always multiple. He remarked, however, that it would not surprise him to find exceptions to this statement at any time.

—Dr. Howard exhibited lantern slides of 2 curious Coleopterous larvæ taken from the recently published second part of Dr. Sharp's "Insecta," namely, *Cnemidotus cæsus* and *Silpha obscura* (originally figured by Schiœdte); also of the pupa of Aspidomorpha sp., all of these figures having reference to previous discussions before the Society. He also exhibited the beautiful plates illustrating the methods of destroying locusts and crickets in Algeria, published in Kunckel's d'Herculais' report on invasions of locusts in Algeria by the French Government in Algeria.

—Mr. Marlatt read a paper entitled "The Influence of Insular Conditions in the Origination of New Species," taking as his text the species of the Coccid genus Parlatoria and indicating that in his opinion the two Ceylonese species, *P. aonidiformis* and *P. cingula*, have been evolved from the only continental form known to occur in Ceylon, namely, *P. proteus*, and showing that the remarkable development of the two insular species is simply an indication of the effect of isolation. Continental forms, by means of constant inter-breeding, maintain a greater uniformity of structure.

The paper was discussed by Messrs. Gill, Ashmead, Vaughn, Dyar and Busck, Dr. Dyar mentioning the unusual development of the Hawaiian form of *Vanessa*, *atalanta*, Mr. Busck the diversity of the Tineids, described from West India Islands by Lord Walsingham, Mr. Ashmead the curious development of the genus Odynerus on the islands of Hawaii, and Dr. Gill, the extraordinary diversity of forms in the terrestrial mollusks in the islands of Hawaii, Cuba, Jamaica, and Haiti, as compared with the much lesser diversity in the same group on the continent of North America. In regard to insects, Dr. Gill said it would be interesting for entomologists in their studies of island faunas to observe whether there was any tendency such as that which has been noted in the birds in the line of reduction of wing area.

May 3, 1900.

The 152d regular meeting was held at the residence of Mr. Frank E. Chapin, 54 R street N.E. President Gill in the chair, and Messrs. Morris, Dyar, Caudell, Benton, Ashmead, Kotinsky, Busck, Chapin, Howard, Marlatt, and Sanderson also present. The Corresponding Secretary read a letter from the Secretary of the Washington Academy of Sciences relative to the movement to erect a building for the scientific societies of Washington.

Under the head of Exhibition of Specimens and Short Notes, Mr. Ashmead showed a new genus of Mymosidæ, a specimen of which he had received from Turkestan from Professor Magretti, of Italy, and which he proposes, with the permission of the Italian entomologist, to call *Magrettina*. The following description of the new genus was submitted by Mr. Ashmead:

MAGRETTINA, A NEW GENUS IN THE FAMILY MYMOSIDÆ.

By William H. Ashmead.

In an exchange of exotic Hymenoptera received recently from the distinguished Italian hymenopterologist, Dr. Paolo Magretti, of Milano, was a single specimen of a fossorial wasp labelled *Meria nocturna* Morawitz, from Turkestan.

It was a male, and I was at once struck by its resemblance to the males in the American genus *Brachycistis* Fox. A close examination of the specimen soon convinced me that the species was not a *Meria*, and that Morawitz was wrong in characterizing it in this genus; that it did not belong to either the families *Myzinidæ* or *Scoliidæ*, Morawitz evidently having been deceived by a superficial resemblance to some forms found in these families; and that it in reality represented a new genus in the family *Mymosidæ*, closely allied to the genera *Brachycistis* Fox and *Milluta* André.

I propose, therefore, to make it the type of a new genus which I shall call *Magrettina*, in honor of Dr. Magretti, and shall here briefly call attention to a few of its more salient characters, which will readily distinguish it from *Brachycistis* and *Milluta*.

It agrees with both of the above-mentioned genera in having a large well-developed stigma, in having the abdomen terminating in a sharp, upward curved aculeus, and in having a somewhat similar habitus, but otherwise is quite distinct. The marginal cell is long, not short, being nearly twice as long as the stigma, the radius originating from near the apex of the stigma; there

are three cubital cells, all large, the second not being triangular and receiving the first recurrent nervure far beyond its middle; the median and submedian cells are equal; the head is transverse, the temples being flat, the eyes large, occupying most of the sides of the head and leaving no malar space; the pronotum is large, transverse quadrate, with a transverse median grooved line above; the mesonotum is quadrate with distinct furrows laterally; the scutellum is subconvex and closely connected posteriorly with a large subconvex post-scutellum; the metanotum is exareolated; the abdomen is briefly but distinctly petiolate, the first segment companulate at apex and not distinctly separated from the second by a constriction, as in *Brachycistis;* while the legs are as in *Brachycistis*, except that the claws are *cleft*, not simple.

Type *Meria nocturna* Morawitz. ♂. Horæ Soc. ent. Ross., XII, 1888, p. 301. Type—Cat. No. 5783, U. S. N. M.

—Mr. Howard, referring to his request at the last meeting for observations on the resting position of Anopheles and Culex, stated that he had secured, through Mr. Pratt, living specimens of *Anopheles quadrimaculatus*, and had verified the resting position mentioned at the last meeting. He had further secured eggs and larvæ of this species, and described at some length the differences between these stages, both as to structure and habits, from similar stages of Culex. Discussion followed in which Messrs. Marlatt, Ashmead, Gill, and Kotinsky took part.

—The first paper of the evening, by Mr. Sanderson, was entitled "Observations on the Larvæ of Donacia."* The speaker made some general remarks on the structural features of Chrysomelid larvæ, and described at length the morphological characters of the larvæ of *Donacia piscatrix*. He called special attention to the sensory pits of the basal joint of the antennæ, to the very curiously modified maxillæ, and especially to the filiform organs on the dorsal surface of the anal end of the body, concluding that these are modified respiratory organs functioning as branchiæ. The biology of the species was also described more briefly. The paper was discussed by Messrs. Gill, Ashmead, and Marlatt, all commending the careful character of the paper.

—Dr. Dyar presented the following paper:

* Published in Canad. Entomologist, Vol. 23, 1900, pp. 249-263.

NOTES ON THE WINTER LEPIDOPTERA OF LAKE WORTH, FLORIDA.

By Harrison G. Dyar.

The strip of land between Lake Worth and the Atlantic Ocean, in Florida, was visited by me in January and February, 1890, and again in 1900. During this interval of ten years a railroad has been built and two large hotels erected in what, at the time of my first visit, was nearly primitive vegetation. The strip of land is about half a mile wide in the central part in the vicinity of Palm Beach, and is divided longitudinally by an area of swamp land into a "beach hammock" and "lake hammock." The former extends the length of the lake, but the latter only for the upper portion, disappearing below and ending in a chain of small islands. This limited area has three different regions: (1) the hammock land or forest, (2) the swamp, and (3) the beach region. The forest covers the crests of the two ridges parallel to the lake. The large trees are the mastic (*Sideroxylon pallidum*), gumbo-limbo (*Bursera gummifera*), palmetto (*Sabal palmetto*), rubbber trees (*Ficus aurea*, *pedunculata*, etc.), bay (*Nectandra willdenoviana*) and poison oak (*Rhus metopium*), with an undergrowth of *Forestiera porulosa*, *Randia aculeata*, *Ardisia pickeringia*, *Condalia ferrea*, *Coccoloba floridana*, *Amyris floridana*, etc., united by vines of *Pisonia aculeata*, *Chiococca racemosa*, Ipomæa spp. etc., all forming a dense and tangled mass of vegetation with no very large or tall trees.

The swamp is mainly filled with saw-grass (*Spartina juncea*) and a few other marsh plants. In the dryer parts are bushes of swamp cedar (*Iva frutescens*), and a few mangroves (*Rhizophora mangle*); but these latter are commoner along the shore of the lake where white mangrove (*Laguncularia racemosa*) and Spanish oak (*Conocarpus erecta*) also occur.

The beach region varies in width in different parts. It extends from the "beach hammock" to the sea. The dominant plant is the saw palmetto (*Serenoa serrulata*) with some bushes of *Myrica cerifera*, *Coccoloba uvifera*, *Persea carolinensis*, and dwarfed specimens of various of the hammock plants. The undergrowth is *Echites umbellata*, *Crotalaria pumila*, and others.

In all these regions the pine and live-oak, so conspicuous a feature of Florida in general, are usually absent. They appear in normal abundance, however, on the west shore of the lake, entirely replacing the subtropical plants.

The larger part of the original "lake hammock" has been destroyed to make room for houses, pastures and lawns, planted to grass (Cenchrus spp.) and concomitant northern weeds, "beautified" by cocoanut trees, oleanders and Hibiscus bushes. The

"beach hammock" is still mostly intact, and in this collecting may still be be done.

In the present remarks the west, or landward side of Lake Worth, will not be considered. There entirely different faunistic conditions prevail.

During the period between 1890 and 1900 the climate of Lake Worth, has perceptibly changed. Formerly cold weather was unknown, but within the last four years frequent cold spells have occurred. Perhaps, on this account, butterfly life was much less abundant as a whole than it was ten years previously.

The plants herein referred to were kindly named for me by Mr. F. Kinzel, a resident botanist. I am also indebted to Mrs. A. T. Slosson, who has spent several winters at Palm Beach, for a list of her captures.

PAPILIONIDÆ.

Papilio polyxenes Fab. Several examples in February, 1900. The food fland at Lake Worth is the Discopleura.

Papilio palamedes Dru. One seen in the beach hammock in February, 1900. Possibly a visitor from the west side of the lake.

Papilio cresphontes Cram. Seen late in February, 1900. Said to be common in summer; the larva on orange. The native food plant, however, is *Xanthoxylon pterota*, as I found an egg on that plant.

NYMPHALIDÆ.

Danais plexippus L. A few worn examples were seen in 1900. No larvæ met with. Apparently the species does not feed on any of the Asclepiadaceæ native to the region.

Danais berenice Cr. Abundant in 1890, but rare in 1900. The larvæ were seen in the former year on a delicate vine. (*Vincetoxicum palustre*.)

Heliconia charitonia Linn. Abundant in 1890, and not perceptibly diminished in 1900. The curious white, black-spined larvæ, were occasionally seen on the *Passiflora pallida*.

Agraulis vanillæ Linn. Fairly common, about the same in both years. The dark red larvæ were occasionally seen on the same plant as the preceding.

Colænis julia Fab. A few examples seen on the wing. Mrs. Slosson has also captured it, but it is rare.

Phyciodes phaon Edw. Several specimens in both years, flying in grassy spots. The butterflies were of the so-called "winter form."

Pyrameis atalanta L. The commonest butterfly in 1900; not seen, that I recollect, in 1890. The food plants are *Parietaria*

debilis and *Boehmeria cylindricæ*, the former little plant being preferred. Both these plants occur in the cultivated land or along roads, and are not seen in the hammock. Clearly this butterfly has increased by the advent of cultivation.

Pyrameis huntera Fab. Several of the larvæ on *Gnaphalium purpureum* were sent me by Mr. Kinzel after I had left Palm Beach. I did not see any butterflies and the species is, perhaps, not to be counted in the winter fauna.

Junonia coenia Hübn. Common, often seen by dozens in 1890; only one seen in 1900. I did not find what plant this butterfly feeds on at Lake Worth, and do not know why they should have so nearly disappeared.

Anartia jatrophæ L. A few examples seen in 1900. The species is rather rare. An examination of all the plants of *Jatropha stimulosa* that were seen failed to show any trace of the larva.

Eunia monima Cr. One specimen seen in 1900 sitting on the trunks of trees in the beach hammock. The species is both shy and rare.

Neonympha sosybius Fab. A few specimens were seen flying in a shaded road through the beach hammock.

Libythea bachmanni Kirtl. A specimen was taken in 1890.

LYCÆNIDÆ.

Thecla cecrops Fab. One example was taken in 1900, several in 1890.

Thecla melinus Hübn. One example.

Lycæna ammon Luc. Abundant; the larvæ feed on certain leguminous plants.

Larva. Elliptical, flattened, the ends, especially posteriorly, obliquely depressed; dorsum arched, subventral fold distinct; subventral region contracted; incisures well marked, deep, the segments short. Green, minutely densely pubescent, the granules stellate with central brownish setæ and surrounding pale ones, the setæ very finely spiculate. Skin between minutely frosted. Coloration rather various; a white line along apex of subventral fold on joints 3 to 13, edged with diffuse reddish on both sides, consisting of reddish granules; a dorsal dark brownish red line, diffuse, widened on the posterior parts of the segments, widest on the thorax, consisting of brown granules on a sordid grayish ground. A broad prominence below the spiracle on joint 12 on the upper aspect of the subventral fold, with a central circular area containing an eversible, radiate gland. Head small, elongate, brownish, eyes black; withdrawn under joint 2. Another example was green, white granular, the dorsal vessel darker, the sides obliquely shaded in paler; a whitish subventral line on the fold. The cervical shield is an impressed triangular area, pointed before. An impressed bar in the dorsal incisure 11–12.

Egg. Cup-shaped, rounded below, flattened and a little hollowed above, with a central, rather large pit at the micropyle. Pale violaceous, very minutely reticulate. A series of strongly raised white lumps, somewhat crested, largest about the upper rim, smaller below, smallest on the flattened upper surface, connected by a series of raised white lines, six to eight radiating from each lump and passing up the bases of these prominences for a short distance, thus forming areas between the prominences. Diameter .5 mm.

Food plants: *Guilandina bonducella*, *Pithecolobium guadaloupense.*

PIERIDÆ.

Callidryas eubule Linn. Frequent in 1890, less common in 1900. I did not find the larvæ.

Callidryas agarithe Bd. Somewhat less common in 1900 than in 1899. Several examples were seen, however, flying on the warmer bright days. The larva feeds on the young tender leaves of *Pithecolobium guadaloupense.* (See Ent. News., xi, 618, 1900).

Callidryas statira Cram. Rare in 1890; not seen in 1900, I think. It would be necessary to net all the yellow Callidryas to be sure there were no *statira*, as they greatly resemble *eubule* on the wing.

Tachyris ilaire Godt. Very abundant in 1890; only a few examples in 1900, but these were fresh.

Pieris monuste Linn. Common in 1890, entirely absent in 1900. The food plant, Bursa, was growing commonly on waste land, but no trace of this larva in the latter year.*

Terias lisa Bd.-Lec. Several examples seen in 1900. I do not recall the species in 1890, though it was common then further north.

HESPERIIDÆ.

Pamphila accius Sm. and Abb. A few examples.

Pamphyla osyka Edw. Less common than the preceding.

Pholisora hayhurstii Edw. Very common in 1890; the larvæ on *Alternanthera flavescens* (see Ins. Life, iii, 389). Comparatively few examples in 1900, and no larvæ found.

Erycides batabano Lef. Larvæ not uncommon on the mangrove in 1890 a few imagines seen. None in 1900, but some signs of the larval houses on the leaves. (Larva described Can Ent. xxii, 211).

Megathymus yuccæ Bd.-Lec. Mrs. Slosson took two in 1900.

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*In the following May, Mr. Kinzel sent me the larvæ feeding on *Cuppari cynophalophora.*

Sphingidæ.

Dilophonota ello Linn. Not uncommon in 1890 and fully as common in 1900. Larvæ on *Euphorbia heterophylla*. In 1890 I met with the brown form of the mature larva only; in 1900 with the green form only. Moth occasionally at light. (Larva, Ent. Amer., vi, 143).

Dilophonota obscura Fab. Rare; the larva feeds on certain of the twining Asclepiadaceæ and is colored remarkably like its food plants.

Stage IV. Head rounded, flattened and held out flat, vertex under joint 2; clypeus low and with the paraclypeal pieces shield-shaped; green, white granular; an upright whitish line from before the dark ocelli to the subdorsal line of the body; width 2.6 mm. Body long and slender, feet short, uniform; cylindrical, slightly narrower posteriorly, of normal shape for the genus. Horn long, directed obliquely backward. Whitish green with white granules, rounded, produced, tipped with pile, making the surface rough. A moderate white subdorsal line from joint 2 anteriorly to the horn, which it curves up to meet. Horn whitish green, pink at base where it touches the subdorsal line. Anal flap elliptical; anal leg plates long triangular, reaching far beyond the anal flap. Spiracles white with black central rectangle.

Stage V. Head round, elongate, the vertex under joint 2; clypeus half way to vertex, shield-shaped. Gray green, longitudinally striped with fine black dots, a white band from antennæ to vertex of lobe; width 4 mm. Body slender, normal, anal plate elongate and rounded, anal leg shields long triangular, the lower anterior corners rounded, extending well beyond the plate. Horn nearly absent, only a short, thick cone. Greenish gray, finely peppered black and white on a green ground; an obscure, broad flesh-colored whitish subdorsal band from joint 2 to the horn; a narrow, sharp, black dorsal line on joints 2 to 4, and gray-black segmentary dots on 5 to 11. Skin granules obscure. Feet neatly banded black, white gray-green, black, white, except the anal pair. Later this marking becomes obscure, but above it the bases of the feet are folded, the concealed part yellow, edged below by the upper black band and a bluish white space with black spots, above by a narrow black line. Thoracic feet pale, narrowly twice annulate with black. Horn-cone dull yellow, olivaceous black at the base and surrounded by a whitish ring. Spiracles brownish with a white dot above and below. With growth the larva becomes very like wood, a dull mottled brown.

The usual warning mark of the genus in the thoracic dorsal incisure is absent here, but the highly-colored bases of the abdominal feet serve the same purpose. A larva which I disturbed fell to the ground and rapidly closed and unclosed its feet, thus exposing the yellow bands.

Pupa under a net in the sand, brown, striped with black, much as in the other species.

Food plants *Philibertia viminalis* and the delicate vine above recorded as the food plant of *Danais berenice*. (*Vincetoxicum palustre.*)

Dilophonota edwardsii Butl. Rather less common in 1900 than in 1890, but no marked difference. The eggs are always abundant on the leaves of the *Carica papaya*, but a very large proportion are worthless. Only the green form of the larva seen in 1890; both forms in 1900. (Larva, Ent. Amer., VI, 141.)

Cautethia grotei Edw. Not uncommon in 1900; the larvæ on the *Chiococca racemosa*. They are of a decidedly Chærocampid appearance (Larva, Psyche VII, 385, Proc. U. S. N. M., XXIII, 255).

Enyo lugubris Linn. At flowers in 1890; not seen in 1900. I have not found the larva unless it be the species feeding on *Randia aculeata* which I bred from egg to stage III. This was green with red horn, the oblique lines white, only the first and last ones distinct. (Notes B 871.)

Pachylia ficus Linn. A specimen at light in 1890 and another in 1900, the larva not seen; probably it is only to be found in the summer.

Protoparce carolina Linn. Specimens were bred on tomato in 1890.

Amphonyx antœus Dru. Bred from larvæ on custard apple (*Anona laurifolia*) in 1900. (Proc. U. S. Nat. Mus., XXIII, 256.)

To this list Mrs. Slosson adds *Aellopos tantalus*, *Amphion nessus*, *Ampelophaga önotus*, *Protoparce cingulata* and *Dolba hylœus*.

Saturniidæ.

Telea polyphemus Cr. Mr. Kinzel picked up a young larva on the beach. The species belongs to the fauna of the west coast of Lake Worth.

Hyperchiria io, var. *lilith* Streck. This is the form of *io* occurring in South Florida. A male example came to light in 1900. No larvæ were seen at Palm Beach, though I have had them at Miami (from the pine barren region), in appearance exactly like normal *io*.

Syntomidæ.

Cosmosoma auge Linn. Not uncommon in both years. The delicate larvæ found on the *Mikania scandens*. (Larva, Psyche, VII, 414.)

Didasys belæ Grt. A moth was taken in February, 1900, but not by myself. The species is very rare in the winter season, and I was not successful in my efforts to find the larva.

Syntomeida epilais Walk. Rare in 1890; one seen in 1900, but Mr. P. C. Truman secured several examples. Larva on oleander, but the native food plant is *Echites umbellata*, as both Mrs. Slosson and Mr. Truman have taken the larva on this plant. (Larva, Ins. Life, II, 360; Journ. N. Y. Ent. Soc., IV, 72.)

Lymire edwardsii Grt. Not uncommon in 1890; rare in 1900. In one season, about 1895, I was told that these larvæ had so defoliated the "rubber trees" as to alarm the inhabitants; but they have not been common again. (Larva, Ins. Life, II, 361.)

Eucereon confine H.-S. Decidedly rare, the larvæ on *Philibertia viminalis* and *Vincetoxicum palustre.* (Larva, Proc. U. S. N. M., XXIII, 262.)

Eupseudosoma floridum Grt. Also a rare species. The handsome, brush-like larvæ were occasionally found on the species of Eugenia. (Larva, Proc. U. S. N. M., XXIII, 258.)

Arctiidæ.

Utetheisa bella Linn. The moths were not uncommon in 1900, flying over Crotalaria, near the ocean beach. I found the larvæ on this plant in 1890.

Callidota strigosa* Walk. A few larvæ occurred to me on the *Guettarda elliptica* and they proved to belong to this species; no moths were taken. The species is rare and the larvæ hard to find on account of their habit of hiding in the day time. (Larva, Proc. U. S. N. M., XXII, 268.)

Halisidota cinctipes Grt. Not found in either year, but several were bred in 1895 from larvæ feeding on *Coccoloba floridana*. (Larva, Psyche, VII, 450.)

Pygarctia abdominalis Grt. I have not taken this moth, but Mrs. Slosson says she has met with it not unfrequently at Palm Beach.

Ecpantheria scribonia Stoll. Common in 1890; a few seen in 1900. The big black larvæ with their red bands used to be a conspicuous feature. (Larva, Can. Ent., XXIII, 106.)

Spilosoma virginica Fab. At light, not common. Larva not seen.

Leucarctia acræa Dru. Bred in 1890 from larvæ feeding on common weeds.

To this list Mrs. Slosson adds *Euhalisidota longa* and *Arctia phyllira*.

Pericopidæ.

Composia fidelissima H. S. Not uncommon in both years in the beach region. Handsome larva on *Echites umbellata*, occa-

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*New generic name for Theages Dyar (nec Walker), Can. Ent., XXIX, 217.

sionally also on the cultivated oleander. A mass of eggs was found also on the vine *Vincetoxicum scoparium*, but the larva is not usual on this plant. Larva, Journ. N. Y. Ent. Soc., IV, 70.

AGARISTIDÆ.

Alypia wittfeldii Hy. Edw. Taken by Mrs. Slosson.

NOCTUIDÆ.

Agrotis ypsilon Rott. Taken by Mrs. Slosson.

Peridroma incivis Guen. Common in the lawns; the larvæ bred both in 1890 and 1900. (See Can. Ent., XXVIII, 18, and Proc. U. S. Nat. Mus., XXIII, 273.)

Feltia malefida Sn. Taken by Mrs. Slosson.

Mamestra laudabilis Guen. Two specimens captured.

Oligia chalcedonia Hübn. Several examples at light.

Oligia nudicolora Guen. At light, about as common as the preceding.

Oligia trientiplaga Walk. A specimen at light. This is the same as *aduncula* Feld., and was kindly named for me from a Brazilian specimen by Sir G. F. Hampson.

Lussa nigroguttata Grt. One example at light.

Magusa dissidens Feld. Rather rare. This species is wrongly placed in our lists among the Quadrifids; it belongs near Prodenia as placed by Möschler. The following is its synonymy:

1872. *Magusa dissidens* Felder, Felder & Rogenhofer, Reise Novara pl. cviii, f. 50.

1874. *Stictoptera divaricata* Grote, 6th rept. Peab. Acad., 37.

1875. *Stictoptera divaricata* Harvey, Bull. Buff. Soc., ii, 281.

1886. *Laphygma angustipennis* Möschler, Beitr. Sch. Jamaica, 71, fig. 14.

1890. *Laphygma divida* Möschler, Lep. Fauna, Porto Rico, 124.

1893. *Magusa divaricata* Smith, Bull. 44, U. S. Nat. Mus., 329.

Larva. Head rounded, bilobed, apex under joint 2, paraclypeal pieces reaching the vertex: translucent green, including the ocelli, but the primary tubercles black; mouth, pale brown; width, 2.5 mm. Body, cylindrical, normal, joint 12 enlarged, the feet equal. Cervical shield transparent, green with black tubercles; anal flap similar, narrowly. Whitish green, finely lined with white or yellowish white; tubercles narrowly black in obscure pale rings. In a large blotch about tubercles ii, iii–iv and vi, the color is faintly stained with yellow, making the ground there yellowish green and the lines pale yellow. The lines are dorsal (strong) above tubercle i, below i (strong) over ii, below ii (strong), two above iii, the upper weak, over iii, below iii, over iv, below spiracle (strong); between these are some faint white mottlings and more distinct ones sub-

ventrally. A line along vi is distinct and almost continuous. Without a lens one sees a white subdorsal line bent up on the hump on joint 12 and a subventral one, a broad yellowish substigmatal line; these only distinctly, the others resolve themselves with a lens. Feet yellow green, claspers reddish. Setæ distinct, black; iv at the upper corner of the spiracle on joint 5, above the middle on joint 6, a trace below the middle on 7, at the upper corner on 8 to 10 even above the spiracle on the latter, half way to tubercle v on 11, below the lower corner on 12. Spiracles white, black rimmed. On joints 3 and 4 all the tubercles are well separated and normal. The larva turned pinkish and entered the ground.

Food plant *Condalia ferrea*, young leaves.

Euthisanotia timais Cram. Not common. The food plant was not determined. Eggs obtained from a ♀ at Nassau, B. W. I., appeared as follows:

Egg. Spheroidal, circular from the vertical aspect with about 28 ribs, rounded, not very sharp yet quite distinct and regular, running nearly to the vertex; each rib is separated by the width of two reticulations. These are uniform, fairly distinct and quadrangular, a nearly straight line running along the apex and hollow of each ridge of the same distinctness as the cross lines. Uniform light yellow. Diameter .8, height .7 mm.

Doryodes bistrialis Gey. This species inhabits the swamp region, the larva on the saw grass (*Spartina juncea*). The egg and first stage only were noted:

Egg. Very large in proportion to the moth; cylindrical centrally, as high as wide, the top rounded, the base less sharply so; about 30 low vertical ribs, not strongly marked and with a very slight wavy outline on the edge; no cross striæ, no reticulations. Dull cream color, not shining, later with irregular brownish freckles. Diameter and height each 1 mm.

Stage I. Head elliptical, narrowed above, vertex under joint 2; clypeus reaching one-third to vertex; luteous, the sutures darker; two faint broad longitudinal brown bands on each lobe, parallel to the body. Ocelli dark; labrum with central smoky line; width .6 mm. Body slender, uniform, a trace flattened, feet on joints 9, 10, and 13. Central part drawn out, the feet of joints 9 and 10 very close together, the anal pair long and divergent; thoracic feet large, colorless. No shields. Whitish, with fine lateral red lines and a dark slaty colored shade from joint 8 posteriorly to 11 anteriorly including the feet of joints 9 and 10. The lines are subdorsal (tubercles i and ii), lateral, stigmatal (iii–iv) and two broken subventral ones. Tubercles minute, black, normal, no subprimaries. Leg shields of joints 9 and 10 blackish with a T-shaped black mark below. Subventral fold broadly whitish. Cervical shield striped, but more luteous than the rest of the body. The gray shade is from within showing by transparency; after eating the larvæ became gray the whole length.

Leucania phragmitidicola Guen. An example at light which was submitted to Prof. J. B. Smith to make the determination certain.

Ingura burseræ n. sp. Purplish gray; a black band before collar; a faint reddish streak centrally and black scales behind; disk of thorax with scattered black and purplish scales; abdomen with dorsal whitish V-shaped marks on 5th to 7th segments, on the latter becoming an oblique subdorsal streak; anal segment with black scales above; segments 2 to 7 with a black bar posteriorly, curved forward on the side to the front edge of the segment forming a waved subdorsal line. Fore wings essentially as in *delineata*, but the subapical tooth of the t. p. line is less produced and more rounded and the apical black dashes relieved by a distinct white powdering. There are but two of these dashes, the upper, marginal one of *delineata* being here lost. Hind wing brownish, the veins and outer third shaded with black. Fringe pale, spotted with black. Expanse 27 mm.

Prof. Smith, on seeing a specimen, thought it "a very fresh, highly marked example of *dclineata*"; but it differs from this by the abdominal markings which more nearly resemble those of *declinata* Grt. and by the white apical dusting.

Types ♂ (crippled) and ♀ in the National Museum, No. 5174.

The larva differs markedly from that of *delineata* (Can. Ent. XXXI, 27), by lacking the transverse dorsal bars and possessing a distinct subdorsal line (Proc. U. S. Nat. M., XXIII, 271). It is not uncommon on the gumbo-limbo (*Bursera gummifera*).

Gonodonta unica Neum. Rare; a few larvæ on the custard apple (*Anona laurifolia*), strikingly marked, somewhat as in the Agaristidæ (Proc. U. S. Nat. Mus. XXIII, 272).

Amolita fessa Grt. A specimen caught in 1890.

Capnodes puncivena Smith. Bred in 1900 from larvæ on Eugenia (Proc. U. S. Nat. Mus., XXIII, 274).

Anticarsia ferruginea Smith. The larva lives on the sea bean (*Canavalia obtusifolia*). Mrs. Slosson tells me that she has found it on this plant. I found one larva in 1890, but it was resting on another plant, and not knowing its food, I lost it. Later I bred the moth from this larva at Nassau, B. W. I.

Larva. *Stage V?* Head whitish, reticulate with purple and with a few large black dots; width 1.3 mm. Body slender, normal, setæ normal for Noctuidæ, vi of cervical shield, prespiracular of prothorax, iia and iib rudimentary; v of thorax and iv of abdomen smaller; setæ on leg plates very short. Two anterior pair of abdominal feet reduced, the anterior pair (joint 7) the most so. Dorsal and stigmatal lines orange blotched, edged narrowly with vinous brown; subdorsal and suprastigmatal lines white, likewise lined; space between dorsal and subdorsal lines whitish, between subdorsal and suprastigmatal lines shaded with purple; subventral space shaded with purple; tubercles v and vi black; feet pale. Dorsal tubercles white with black rings.

Stage VI. Head white with irregular black spots, the largest of them forming a transverse line above the clypeus; mouth black, setæ black; width 2.1 mm. Dorsal line pale orange, edged with purplish black; then bluish white centered with faint brownish streaks; subdorsal band pale ocherous edged like the dorsal one; then a pale lilac space; suprastigmatal band white, irregular, edged like the dorsal one, the lower edging interrupted; broad orange stigmatal band edged below with white and a purplish black line. Subventral space and legs dull whitish gray; venter white. Lines partly obsolete on cervical shield and anal plate. Feet spotted with black; setæ black. Larva an imperfect semilooper.

Stage VII. Head 2.8 mm., whitish, black spotted with faint purplish reticulations. Body brownish cream color, dorsal and subdorsal lines orange, doubly black edged, the color diluted before the edge; a faint shade between. Lateral (tubercle iii) and stigmatal lines in apposition, divided by a black line and black edged above, below white; a red dot above tubercle iv in the stigmatal band. Space between subdorsal and lateral bands as wide as either and dark brownish. Substigmatal band again adjacent, white, bright; subventer and venter dark olivaceous, uniform, slightly lined. Tubercles white with black ring and center; setæ distinct, dark, normal.

The larva is slender, joint 13 tapering. It rests quietly by day, feeding at night.

Eumestleta flammicincta Walk. (= *Thalpochares patula* Morr.) A specimen at light.

Remigia latipes Guen. Not uncommon in the artificial lawns, the larva feeding on the grass (Cenchrus). (Proc. U. S. Nat. Mus., XXIII, 276.)

Bleptina caradrinalis Guen. Two examples at light in 1900.

Palthis asopialis Guen. Rather common at light.

Bomolocha manalis Walk. A single specimen taken.

Mrs. Slosson adds to this list *Pyrophila trapogonius*, *Ingura pygmæa*, *Litoprosopus futilis*, *Acontia debilis* (determination not certain), *Litosia convalescens*, *Anticarsia gemmatilis* and *Antiblemma minorata*.

GEOMETRIDÆ.

Racheospila saltusaria Hulst. Bred from larvæ on *Condalia ferrea* (*see* Psyche, IX, 118.) The larvæ were such perfect mimics of the numerous little green twigs than arise from the older brown branches of this tree that it was impracticable to look for them, as even if seen they would not be recognized. Those obtained were gotten by chance while looking for other things.

Synchlora excurvaria Pack. (= *Nemoria denticulata* Walk.) Bred in 1890 (*see* Ent. News, V, 62, 1894); also, an example at light in 1900.

Synchlora louisa Hulst. So named by Dr. Hulst. The specimen (♂), however, differ smarkedly from the type which is before me. The discal dots on the four wings are punctiform and black, not red; the costa of primaries is white on the edge, narrowly red behind this, and only broadly marked at the extreme base; not broadly red to apex, widened in and at end of cell; the margins of the wings are red only in a marginal line and on the fringe throughout, cut with white intravenular dashes, not with a distinct widening at veins 1c and 5 of fore wings and anal angle and apex of hind wings; the thorax and base of abdomen are green, the red stripe with enclosed white spots begins on the second segment, not broadly red from collar to penultimate abdominal segment. It may be called var. *hulstiana* (or *bon. sp.?*)

Larva. Head rounded, slightly retracted, luteous with dense white granules; width 8 mm. Body green with dense, secondary, pointed white granules; angular subventral projections on joints 5 to 9, bearing tubercles iv and v. Tubercle iv large, a long cone with many little spines to which various objects adhere. Tubercles i to iii small, v larger, vi and vii small. The large tubercles are iv of joint 6 to 9 and iii of joint 5, as is normal in the group. A faint broken white dorsal line and stripes posteriorly on the projections. One larva found on the flower head of *Lantana camara.*

Percnoptilota fluviata Hübn. Several examples at light.

Cœnocalpe parinotata Zell. At light like the preceding.

Senelys subquadrata Guen. Also at light, less frequent.

Gypsochroa hæsitata Guen. Not uncommon, the larvæ on *Pisonia aculeata* (see Psyche IX, 59, 1900). The eggs are laid on threads like those of *Eudule mendica.*

Cysteophora pervertipennis Hulst. Two specimens at light, one of which served as Dr. Hulst's type. The female resembles the male, but the antennæ are simple and the hind wings are without the pouches; the borders of both wings are heavily shaded with purplish, darker than in the male.

Emilitis floridata Hulst. Several examples at light.

Eois ossularia Hübn. Some examples at light.

Eois balistraria Hübn. Also at light with the preceding.

Eois suavata Hulst. A specimen in the beach hammock furnished eggs from which the life history was made out. (See Psyche IX, 106, 1900).

Eois eburneata Guen. Dr. Hulst remarks: "Very close to *eburneata* and I think that species;" but the specimen does not agree with another from Cocoanut Grove, Florida, labelled with this name by Dr. Hulst.

Wauchula rubrotincta Hulst. One example at light furnished Dr. Hulst's type of this new genus and species.

Leptomeria laretaria Hübn. (*Minutularia* Hulst), one example.

Diastictis abbreviata Walk. (*Floridata* Hulst), at light.

Mecoceras nitocris Cram. Larvæ on *Coccoloba floridana* (see Psyche IX, 69, 1900).

Nepheloleuca politia Cram. Taken at light, the larva not found.

Phrygionis argentata Dru. Dr. Hulst named the moth as *P. argentistriata* Streck., but I do not think that it differs from the Antillean form. If I am correct the following synoymy will obtain:

1773. *Geometer argentata* Drury, Ill. ex. ent., ii, 27, pl. xiv, f. 2.

1791. *Phalæna Geometer politata* Stoll. Suppl. Cramer's Pap. exot., pl. xxxi, f. 4.

1793. *Phalæna decorata* Fabricius, Ent. Syst. iii (2) 173.

1857. *Byssodes privignaria* Guenée Spec. gen. Lep., ix, 601.

1876. *Phrygionis argentistriata* Strecker, Proc. acad. nat. sci, Phil., 152.

1882. *Byssodes cerussata* Grote, Papilio, ii, 101.

1882. *Byssodes obrussata* Grote, Can. ent. xiv, 111, xv, 6.

1886. *Phrygionis argentistriata* Hulst, Ent. amer., ii 222.

1890. *Eulepidotus argentata* Möschler, Abhl. Senck. Ges. xiv, 246.

1892. *Byssodes privignaria* Druce, Biol. Cent.-Am. Lep. Het, ii, 98.

1896. *Phrygionis argenteostriata* Hulst, Trans. Am. ent. soc., xxiii, 384.

The larva occurred on the young leaves of *Ardisia pickeringia*, and the last three stages were observed.

Stage III. Head whitish with a straight brown stripe up the middle to vertex and one on each side across ocelli to lower angle of cheeks, the three meeting on the mouth; width .7 mm. Body rather thick, tapering a little at the ends, smooth, cylindrical, feet normal, incisures rather well marked; very obscure annulets. Whitish, food green, a brown, diffuse, dorsal and substigmatal stripe, joining those of the head, reaching the ends. Feet short, pale. Dorsal stripe darker spotted in the incisures. Setæ very fine and short, dark; tubercles obsolete.

Stage IV. Head whitish, faintly testaceous tinted, lateral stripe and attennæ red brown, vertical stripe absent on clypeus, bordering the median suture, paler red; jaws reddish; width 1.1 mm. Body translucent sordid bluish green from the food, joints 2 and 10 to 13 paler, whitish; a row of dorsal round black spots on the segments anteriorly, almost in the incisures of joints 6 to 9, represented by a round reddish shade on the thorax and joints 10 to 13. Subventral stripe broad, brownish red, diffuse, reaching from joint 2 to the anal foot on which it runs narrowly. Venter unspotted; skin smooth.

Stage V. Head round, slightly bilobed, clypeus less than half to vertex; yellowish green, mottled around the median suture with reddish; a dark red band from base of jaws over the black ocelli to occiput; width

1.6 mm. Body cylindrical, thick and smooth, normal. Green finely obscurely lined longitudinally with whitish green; a broad, diffuse subventral red shade. Dorsal round black spots on joints 6 to 8 anteriorly. Ends faintly tinted with reddish mottlings. Tubercles minute, setæ short, dark. Venter slightly whitish. The reddish suffusion at the ends increases with age, especially subventrally. The larva is exactly the color of the young Ardisia stem.

To this list Mrs. Slosson adds *Diastictis particolor* Hulst and *Palyas auriferaria* Hulst.

PYRALIDÆ.

Margaronia infimalis Guen. The larvæ were bred in 1890 on *Melothria grendula;* none seen in 1900. (Description, Journ. N. Y. Ent. Soc., March, 1901.)

Margaronia quadristigmalis Guen. The larvæ were not uncommon on the *Forestiera porulolsa*, slightly webbing the leaves together. (See also Howard and Lugger, Ins. Life, I, 22, 1888.) The egg shells were found on the backs of the leaves, elliptical, flat, with very slight thickness, 9 x 4 mm., finely roundedly reticulate. The earliest larvæ observed were mining in the leaves, the mine linear, wide but short, not over twice the length of the larva and with a hole for the ejection of the frass. Later they live between the leaves. The last four stages were observed with very little change. Head broad, outstretched, flatly, the lobes rounded, paraclypeal pieces reaching vertex; colorless, shaded with brown over the lobes; mouth brown, occelli black; width 1.5 mm. Cervical shield large, colorless. Segments slightly moniliform, the thorax narrower than the abdomen, joint 5 wider, joints 12 and 13 tapering a little, last half of joint 13 smaller. Anal feet outstretched, divergent; the others small, slender. Whitish and translucent, shining with a green tint; joints 12 and 13 faintly brownish reticulate to match the head. A small black dot on joints 3 and 4 on the front side of tubercle iib. Tubercles large, transparent; i and ii in line, iv and v united, normal. On thorax ia + ib, iia + iib, iv + v, the subventral ones smaller. The mature larva varies from translucent green to whitish with faint brown reticulations on the head.

Margaronia flegia Cram. Mr. Kinzel sent me moths and larvæ that he had found on a cultivated bush of Thervetia. The species is common at Key West. (See Can. Ent., XXXII, 117, 1900.)

Margaronia sibillalis Walk. This larva was rather destructive to the mulberry, though somewhat rare in the winter season; the mulberry trees having lost their leaves. The last three stages only were observed with widths of head .9, 1.2 and 1.7 mm., and no marked changes. (See Journ. N. Y. Ent. Soc., March, 1901.)

Sylepta anormalis Guen. The larva was not uncommon on the leaves of "morning glory" (*Ipomœa sp.*). At first it stitches the leaves together; finally it forms a rather characteristic tent on the upper side, partly folding a leaf together with a web above. (See Journ. N. Y. Ent. Soc., March, 1901.)

Sylepta fluctuosalis Led. Professor Fernald determined the moth for us with a query. The larvæ were very common as leaf rollers on the nettle (*Bœhmeria cylindrica*). They roll up a leaf, wrapping in around with the back side inward and tying it with bands of silk on the outside.

Head squarish below, mouth projecting, slightly bilobed, the apex under joint 2; clypeus high, the paraclypeal pieces reaching vertex; pale green, jaws black, visible through the transparent labrum; paraclypeal pieces smoky black; a heavy black-brown band on the lower angle of the cheeks from jaws to back of head; mottlings also on the vertices of lobes posteriorly; width 1.8 mm. Body moderately robust, not tapering; translucent whitish green, tracheæ white, distinct; dorsal vessel dark green. Cervical shield large, transparent, but with a broad black lateral margin that reaches round posteriorly opposite tubercle i of joint 3. Tubercles moderate, transparent; those of joint 3 faintly dusky bordered. Hair tubercle itself brownish; setæ pale, rather long. Tubercles i and ii nearly in line, iv and v united, normal; on thorax ia+ib, iia+iib, iv+v. Feet pale, normal. Spiracles whitish.

Sylepta gordialis Guen. The larva lives on the *Pisonia aculeata*, but is at times injurious to the cultivated Bougainvillia. (See Journ. N. Y. Ent. Soc., March, 1901.) The egg is laid on a leaf or stem toward the end of a branch. It is perfectly flat but somewhat thicker and more opaque than a Cochlidian egg. Elliptical, 1.0 × .8 mm. slightly shining, milky translucent; reticulations distinct, linear, irregularly pentagonal. Shell iridescent.

Several larval stages were observed but not in sequence. I have published a description of the mature form.

Dichogama amabilis Möschl. The larvæ of this pretty moth were found rarely in tight box-like abodes between leaves of *Capparis jamaicensis.* (See Journ. N. Y. Ent. Soc., March, 1901.) The last two stages only were observed.

Dichogama redtenbacheri Led. The larvæ were common occasionally on the *Capparis cynophallophora*, between closely united leaves. (Can. Ent., XXXII, 271, 1900.)

Dichogama bergii Möschl. The larvæ occurred with the last, but much rarer. (See Journ. N. Y. Ent. Soc., March, 1901.)

Evergestis dyaralis Fern. The larvæ appeared sporadically on the young leaves of the *Drypetis crocea*, in a loose, open, delicate web that disappears after the larvæ are gone. Not gregarious, though many occur on the same branch, owing to the scarcity of young leaves. Last two stages observed.

Head bilobed, colorless, clypeus reaching vertex; width .75 mm. Cervical shield transverse, sordid greenish. Body greenish with broad brown subdorsal stripe, partly enclosing tubercles i and iii and completely so tubercle ii, but not coloring the sordid, greenish rimmed tubercles. Anal plate sordid. Tubercles i to iii large. iv+v and vi small, pale, concolorous. Setæ moderate, pale. When filled with food the larvæ are sordid greenish, tubercles i to iii blackish, iv+v and vi less distinctly so. Traces of whitish edges to the subdorsal line.

Last stage. Head broad, round, bilobed, paraclypeal pieces reaching vertex; mouth large; greenish, faintly brownish on the vertex, tubercles pale but all strongly black ringed; vertex scarcely under joint 2; width 1.5 mm. Body somewhat flattened, uniform, tubercles i to iii large, on joint 13 somewhat angular and prominent; iv and v small, black, contiguous, iv dorsad; vi small, vii of three setæ on the leg base, the two lower ones pale. Pale green, a broad blackish subdorsal band, slightly broken by pale rings about the tubercles and intersegmental mottlings, the pair joining posteriorly on joint 13 and anteriorly by the large, blackish, scarcely bisected cervical shield. The subdorsal band nearly encloses tubercles i and iii, and does not quite touch a faint white bordering line above and below, the upper line crossing tubercle i, the lower stigmatal. Tubercles black, setæ moderate pale. Feet pale. On thorax tubercles ia+ib, iia+iib, iv+v; on abdomen the green dorsum is encroached on by tubercles i and ii of joint 12; elsewhere i is well dorsad to ii.

Epicorsia mellinalis Hübn. The neatly colored larva of this species occurred on the "fiddle wood" (*Citharexylum villosum*). I have described it elsewhere. (Jour. N. Y. Ent. Soc., March, 1901.)

Mecyna reversalis Guen. The pretty and striking larvæ occurred on the *Sophora tomentosa* in both years. At first glance I thought them to be *Utetheisa bella*. The larva has been described by Lintner. (11th rept. ins. N. Y., 142, 1896.)

Head bilobed, the lobes broad, full, paraclypeal pieces reaching vertex; antennæ half as long as the mandibles; shining black, labrum pale luteous; width 2.8 mm. Thoracic feet black, ringed with white; abdominal ones slender, green, the crochets in a circle, broadly broken outwardly. Body rather long, uniform, cylindrical; cervical shield and anal plate jet black, the former with central white line and subdorsal dash; the latter with a median irregular mark, lateral margin white. Body translucent sap green or dull orange green, the large tubercles white and black; i and ii are black, incised by a white spot above and below; iii is similar but the lower white spot includes the spiracle, and there is a white border before and a lobe to include tubercle iiia; iv+v is in a long white streak on the subventral fold which surrounds it; vi is in the upper part of a white patch; vii black at the edge but luteous about the three setæ. Thoracic tubercles

partly surrounded by white, the borders touching except vi which is remote and separated by a yellow and white streak on the subventral fold; ia+ib, iia+iib, iv+v. Anal feet with black bases. The larvæ live under a very delicate web on the back of a leaf, which is so fine that they appear to feed exposed. The leaves are not drawn together at all.

Desmia tages Cram. The larvæ are leaf rollers on the *Psychotria undata.* (See Journ. N. Y. Ent. Soc., March, 1901.) The leaf is rolled up in several turns fastened with stitches on the outside; the larva eats out all within, the frass being retained in an unsightly mass. The larva has a large cervical shield, blackish luteous, bisected; no anal plate. Body cylindrical, normal, the incisures moderate; transparent, colorless, the food dark blackish green, reddish in the thorax. Tubercles large, colorless, faintly blackish on thorax; ia+ib, iia+iib, iv+v; on abdomen iv+v nearly in line longitudinally, iv a trace dorsad. Tracheæ and excretory tubules white; spiracles pale, testaceous rimmed; setæ long, pale.

These notes are on the penultimate stage; the last one has been described elsewhere.

Marasmia trapezalis Guen. A specimen at light was named by Prof. Fernald.

Marasmia floridalis Fern. A bred specimen furnished one of Prof. Fernald's types. The larvæ feed on the *Vincetoxicum palustre.* They eat a turned over leaf, seed pod or bud, and rest in an adherent case of web and whitish excrement which remains on the leaf. The last two stages observed.

Head slightly bilobed, full, rounded, clypeus high, the paraclypeal pieces reaching vertex; one distinct large seta (ii), the rest minute; pale luteous; width .6 mm. Body short and robust, the segments 3-annulate, the anterior annulet very small. Tubercles slightly elevated, moderate, colorless; on thorax ia+ib, iia+iib, iv+v. Hair tubercles brown. Green, a faint vinous dorsal line and transverse line on the posterior annulet of each segment. A broad, faint, whitish, substigmatal band. Shields concolorous.

Last stage. Head all green like the body; width .85 mm. As before, the lateral stripe very obscure. The larva is a hunched up little thing, smaller posteriorly. Later the lateral whitish stripe is sharp above at the spiracle, diffuse below; the vinous bands are brownish, obscure except towards the extremities. Still later the red coloration is gone, the larva is all green like a bit of the stem with the whitish lateral shaded band, sharp above.

Pyrausta costimaculalis Fern. Described from my bred specimens. The larvæ are so similar in structure and habits to the preceding that I supposed them to be congeneric till the moths were obtained. The larva lives on the *Psychotria undata.* It

cuts off at the middle and fastens to the petiole by silky web a small opening leaf at the end of a branch. It has the habit of eating out the buds.

Head rounded, ochraceous tinted, sordid; vertex under joint 2; width .8 mm. Body green, thorax shaded with vinous; a dull brown blotched dorsal stripe on joints 11 to 13, widening behind. Another much larger larva but with the head the same size had eaten the bud and mined some distance into the stem. Body robust, large for the head, thick centrally and tapering towards the ends. Anterior end, joints 2 to 5, heavily shaded with vinous, fainter posteriorly, with faint dorsal and lateral continuations. The extent of this mark is variable. Tubercles large, green, transparent, the hair tubercles brown; i and ii not quite in line, iv and v united; on thorax ia+ib, iia+iib, iv+v, normal. Segments folded posteriorly, obscurely 2-annulate. Feet normal, slender. Setæ rather long, brown, especially at the ends. Shields weakly cornified, greenish like the tubercles. No lateral stripe.

Pyrausta tyralis Guen. Several examples at light. Some are of a suffused form with the yellow lines on both wings suffused with vinous and almost obliterated.

Hellula undalis Fabr. Several specimens at light and flying in grassy places.

Terasia meticulosalis Guen. The larva bores in young stems of *Erythrina herbacea*, often destroying a majority of the flower clusters and rendering the plants unsightly. (See Jour. N. Y. Ent. Soc., March, 1901.)

Agathodes designalis Guen. On the same plant with the preceding, but not a borer; making a web among the flowers. (See Journ. N. Y. Ent. Soc., March, 1901.)

Nomophila noctuella Schiff. A specimen flying in the woods.

Lineodes integra Zell. Bred from larvæ on *Solanum radula* and *S. jasminifolium.* (Jour. N. Y. Ent. Soc., March, 1901.)

Lineodes contortalis Guen. Two specimens at light.

Lineodes triangulalis Möschl. Bred from larvæ on *Capsicum frutescens.* (See Journ. N. Y. Ent. Soc., March, 1901.)

Galasa rubidana Walk. At light.

Hydrocampa obliteralis Walk. Two specimens at light.

Hydrocampa allionealis Walk. Commonly at light.

Nymphula cannalis Quaint. Leaf rollers on *Canna flaccida*, common. The larva has been quite fully described by Quaintance (Fl. Agr. Exp. Sta., Bull. No. 45, page 71, 1898.) I add my notes:

Head small for the large body, bilobed, clypeus high, reaching nearly to vertex; pale luteous, mouth brownish, ocelli black; width 1.3 mm. Body cylindrical, tapering at both ends, incisures moderate, folded. Shields and tubercles transparent, faintly testaceous tinged at the ends. Body transparent, a little milky, food dark green. Cervical shield with black setæ and little brown punctures in a curved row each side of the middle;

anal plate like the tubercles, which are large, those of joints 3, 4, and 13 brown punctured. On thorax tubercles ia + ib, iia + iib, large, elongate longitudinally, iv + v; on abdomen i larger than ii, obliquely elongate, slightly dorsad; iv + v, iv slightly dorsad. Feet short, normal; tracheæ white; dorsal vessel dark.

Nymphœella maculalis Clem. A few specimens at light.

Thyridopyralis gallærandialis Dyar. Bred from galls in the old wood of the *Randia aculeata*. (See Journ. N. Y. Ent. Soc., March, 1901.)

Argyria nivalis Dru. One at light.

Crambus hastiferellus Walk. Also at light.

Crambus mutabilis Clem. At light, commoner.

Diatræa saccharalis Fab. Rather rare at light.

Chilo densellus Zell. Not uncommon at light.

Stericta incrustalis Hulst. Bred from larvæ on *Nectandra willdenoviana*. (See Proc. U. S. Natl. Museum, XXIII, 283, 1900.)

Benta floridella Hulst. The bred specimens furnished Dr. Hulst's type. The larvæ occurred commonly on the *Guilandina bonducella*, uniting the leaves in a fine loose web which holds frass and dead leaves, making an unsightly mass. Larvæ of all ages may be found in the web. They eat the leaves or partly mine the leaf stem, but live in a silken tube without much frass inside the web. Five stages were observed.

Head rounded, not bilobed, the upper edge below joint 2; paraclypeal pieces extending to level of tubercle i; dull whitish, heavily mottled with brown spots in groups, width 2.2 mm. Body dead-leaf brown. Dorsum rather broadly pale brown with a diffuse geminate red-brown stripe. Rest of body pale wood brown with brown spots; a broad, heavy, black subdorsal band enclosing tubercles i and ii in its upper edge; a lateral and a suprastigmatal (iii) dark brown line, the lateral not fully distinct from the subdorsal one. Feet short, crochets in a ring. Tubercles small, black; i and ii in line, iv and v approximate, but quite separate, v before and dorsad to iv. On thorax ia and ib, iia and iib, iv and v, approximate in pairs. Spiracles black ringed. Setæ long, brown. Skin densely transversely wrinkled, the segments otherwise 3-annulate, the anterior annulet small, and not reaching the dorsum. Thoracic feet brown. Cervical shield and anal plate both large and hard, but marked exactly like the body, the anal plate being entirely brown, peppered with darker, as the bands are obsolete on joint 12.

Salebria celtidella Hulst. One at light.

Honora dulciella Hulst. A captured specimen furnished Dr. Hulst's type.

Elasmopalpus lignosellus Zell. One example named by Dr. Hulst.

Sarasota plumigerella Hulst. Dr. Hulst's type was bred from a larva on *Laguncularia racemosa* in a soft web only in the young opening leaves, solitary.

Head rounded, clypeus high, apex under joint 2, held flat, mouth projecting; width 1.1 mm. Green mottled with brown, especially above. Body slender, cylindrical, scarcely tapering, no shields Dull green, opaque, mottled with brown, heaviest in a broad, obscurely double lateral band below tubercle ii and just covering iii; a narrow brown dorsal line edged by addorsal lines of the ground color. Subventrally the brown mottlings fade out; feet green. A black ring about tubercle ii on joint 3. Tubercles black, setæ long, pale brownish. Segments divided into two annulets by a narrow line with a third smaller one laterally. Tubercles i and ii in line, iv and v closely approximate but separate, v dorsad by its own diameter and a little smaller; on thorax ia and ib closely approximate ia small. Spiracles round, yellowish. Cervical shield perfectly concolorous, bearing six setæ, normal.

To this list Mrs. Slosson adds *Pilocrocis ramentalis* Led., *Agriphila perstrialis* Hbn., and *Melitara prodenialis* Walk.

Thyrididæ.

Hexeris enhydris Grote. This was taken by Mrs. Slosson.

Nolidæ.

Nola apera Druce (*involuta* Dyar). Bred specimens cannot be distinguished from the Californian species, except by a slightly darker, more bluish gray color. This is very surprising, as the larvæ had all the appearances of representing a distinct species, being found only on the *Laguncularia racemosa*, a plant growing only on the borders of the lake, partly in the water. The larvæ are at first leaf miners with a hole for the ejection of the frass. Later they cut channels in the thick leaves. At all times they hide persistently. This seems different from the willow feeding Californian species, yet neither larva nor moth differ to a specific degree. If the contrary opinion should obtain, however, I would propose to call the form *Nola laguncularicæ*.

Larva. Squarely flattened; four rows of warts, the lowest small; feet on joints 8 to 10, all normal for Nola. Head round, small, below joint 2, clypeus broadly triangular, rather high, whitish, nearly colorless, jaws brown, ocelli black; width, about .8 mm. Body reddish luteous, joints 3 and 4 somewhat broadly so on dorsum. A broad black subdorsal stripe, faint on joint 2, narrow on 3 and 4, wide on 5 to 12, where it ends, covering the two upper warts. In the incisure of joints 6 and 7 and 12 the pair nearly join. A narrow yellowish dorsal line of the ground color; a reddish circle on joints 3 and 4, somewhat broken. Sides reddish, but the hird wart (iv + v) yellow. Feet and venter whitish, nearly colorless.

Hairs short, dusky, long and pale from the third wart, only a few from the fourth which is colorless. Anal flap pale. Cervical shield scarcely cornified, brownish, bisected. The larvæ vary a good deal in coloration.

PTEROPHORIDÆ.

Pterophorus monodactylus Linn. The larvæ occurred rarely on the *Ipomœa hederacea*, feeding on the young leaves at the end of a shoot. Green, without marks, except a broken white dorsal line, and traces of a segmentally arcuate subdorsal band. Warts round, i and ii confluent, a single hair behind iv + v, no secondary hairs. Hairs whitish, stiff, some of those from i + ii blackish. Later a straight broad yellowish subdorsal band. *Last stage.* Dorsum narrowly blackish, especially at the base of warts i + ii, which are contiguous, not confluent. Rest of body yellowish green, the subdorsal and a lower waved subdorsal band faint. Spiracles black ringed. Hair stiff, blackish dorsally, pale laterally. Wart iiib more remote from iv + v than before and a little dorsad. Some dark hairs from wart iv + v.

Pterophorus sp. A very interesting stem borer occurred in *Iva frutescens*, but it could not be bred. Larvæ lived until May 28, on stems of the Iva kindly sent me by Mr. Kinzel from time to time, but no pupæ were obtained. (Notes, B 868.)

COCHLIDIIDÆ.

Sibine stimulea Clem. A few larvæ in both years, rarer in 1900. They feed on almost anything. The two larvæ seen in 1900 were on *Sebastiania lucida* and *Verbesina virginica*, respectively.

Euclea delphinii Guer. Not seen in either 1890 or 1900, but a few examples secured in an intervening year. (See Journ. N. Y. Ent. Soc.)

Alarodia slossoniæ Pack. A few empty cocoons on the mangrove in 1890. Rather common in 1900, mostly on the mangrove but some on *Myrsine floridana* and traces of the larvæ on one bush of *Ardisia pickeringia* and *Myrica cerifera*. The plant mentioned (Journn. N. Y. Ent. Soc., VI, 160) as "another plant not determined" proves to be *Hypelate paniculata*. No larvæ were seen on this tree at Palm Beach, though it occurs sparingly.

SESIIDÆ.

Sesia seminole Beut. A pair taken by Mr. P. C. Truman in 1900, and kindly presented to me, are now in the National Museum.

TORTRICIDÆ.

Cacœcia georgiana Walk. Prof. Fernald named the moth with a query. The larvæ were found webbing together the leaves

of the *Chiococca racemosa*, the abode webby, not fastened with stitches. Head rounded, paraclypeal pieces reaching vertex, a little flattened before; green, brownish shaded on the lobes; ocelli neatly black, mouth brown; width about 1 mm. Body moderately slender, segments obscurely 3-annulate, the anterior annulet small. Transparent bright green, no marks. Shields transparent; tubercles small, somewhat elevated, colorless, normal; on thorax ia+ib, iia+iib, iv+v. Spiracles small, whitish; feet pale, normal. Setæ moderate, white. Larva lively and runs backward easily.

Tortrix peritana Clem. Very common at light.

Tortrix ivana Fern. My specimen furnished Prof. Fernald's type. Bred from some *Iva imbricata* leaves by Mr. Busck that were sent him in connection with certain Tineids. We have no notes on the larva. (See remarks under *Gnorimoschema terracottella* following.)

Platynota rostrana Walk. The larva was not uncommon and living on a variety of plants. Bred from *Rivina humilis*, *Randia aculeata*, *Gnaphalium purpureum* and a larva (parasitized) was taken on *Myrsine floridana*. Last three stages observed.

Stage, head .65 mm wide. Head slightly below joint 2, bilobed, rounded, full, clypeus high; brown black, mouth brown. Cervical shield large, semicircular, luteous black, shading to brown on the anterior edge. First thoracic feet black except the basal joint, the rest black tipped. Body cylindrical, tapering a little posteriorly. Feet with crochets in an ellipse, short, normal. Whitish, translucent, a faint, broken, irregular, white addorsal and lateral line. Tubercles whitish, the hair tubercles black; spiracles black ringed; anal flap concolorus with body.

Stage, head .8 mm wide. Head rounded bilobed, mouth pointed, smooth, clypeus rather high, not depressed; shining black, epistoma pale. Cervical shield transverse, semicircular, shallowly notched behind, black. Feet of joint 2 black, the others pale. Body slender, translucent white, dorsal vascular line darker with some white pigment on each side; food dark, plainly showing. Tubercles rather large, pale with brown hair dots; iv+v, i dorsad to ii; segments 2-annulate dorsally; anal plate brown punctate. Prespiracular wart of joint 2 large and black, subventral wart blackish. On thorax ia+ib, iia+iib, iv+v. Feet normal, skin finely granular. Spiracles black ringed.

Last Stage. Head flattened, bilobed, vertex under joint 2, clypeus nearly reaching vertex; dark brown, shining, epistoma and basal joints of antennæ white; ocelli large, black; width 1.3 mm. Cervical shield large, covering the dorsum of joint 2, touching the prespiracular tubercle, slightly notched behind, with the tubercles of joint 2, luteous brown, shading to black centrally and behind. Body sordid olivaceous green, slender, a little flattened ventrally; segments 3-annulate, the first annulet small. Dorsal vessel dark by transparency. Tubercles moderate, white, contrasted with

the brown hair dots. Anal plate with tubercles and traces of brown punctures. Thoracic feet brown; abdominal ones small, normal, the crochets in a complete ellipse. Setæ moderate, pale. Spiracles black ringed. Tubercles as before, iv above v, united; vii of three setæ in a nearly straight line.

Lophoderus amatuna Dyar. The larvæ were found tying together the leaves of *Anona laurifolia*. Head flattened, outstretched, paraclypeal pieces reaching vertex; shining pale green, faintly brown tinged, ocelli rather large, black; width 1.3 mm. Body segments 2-annulate dorsally, subventral fold moderate; all translucent dark green, but more or less, often mostly light yellow green from the fat, especially posteriorly in joints 6 to 12, the dorsal vessel dark green as are also joints 2 and 13. Shields and tubercles transparent, concolorous. Tubercles moderate, slightly elevated, iv+v, normal; on thorax ia+ib, iia+iib, iv+v. Setæ fine, rather long, brownish. Skin only slightly shining. Feet normal.

Eucosma lineana Fern. Described from my bred specimen. The larva occurred on *Anona laurifolia* mixed with the preceding species from which it only differed in being shaded with blackish except the tubercles and incisures.

Pœdisca strenuana Walk. At light; determined by Prof. Fernald with a query.

Capua lentignosana Wals. At light and likewise determined with a query.

Conchylis bunteana Robs. Common at light.

Bactra lanceolana Hübn. Several at light.

Episimus augmentanus Zell. The larvæ occurred on *Rhus metopium*, webbing together the leaves. Head rounded, flat before, apex under joint 2, clypeus high; pale luteous, sordid, a blackish shade in clypeus and one about and extending upwards from ocelli; width 1.2 mm. Body sordid translucent yellowish, food green. Cervical shield large, shining, divided by a very narrow white line, luteous in the center of each half and posteriorly dorsally, the rims and a median patch shaded blackish; no anal plate. Body rather thick, hunched, a little flattened. Tubercles moderate, smoky, i larger than ii and dorsad to it, iv+v; on thorax ia+ib, iia+iib, normal. The tubercles are shining, radially corrugated about the edge. Skin dull; setæ white.

Epiblema ochraceana Fern. The moths were taken resting on the *Iva imbricata* very close to the sea; but the larvæ were not detected.

Cerorrhincta calidana Zell. Named by Prof. Fernald with a query. The larvæ were common on a species of Eugenia (*E. procera*?), uniting the leaves by webby silk and eating the parenchyma. Head rounded, the apex slightly below joint 2, clypeus

high; yellowish testaceous, mouth dark, ocelli black; antennæ rather long; width 1.2 mm. Body rather thick, the ends rounded, not tapering; segments obscurely 2-annulate, incisures folded. Tubercles large, elevated, colorless, iv+v in one tubercle, v small. Translucent, slightly olivaceous, not shining; food green, slightly obscured by the opacity of the skin. Setæ moderate, pale; feet normal. No marks.

Lepidoptycha maculana Fern. Described from my bred specimens. The larvæ feed on *Schœpfia arborescens.* The earliest larvæ mine the leaf, a linear crooked mine, often somewhat extensive, the frass pushed out the entrance hole on the under side of the leaf. The larvæ are colorless, the food green. Later larvæ unite overlapping leaves and finally turn over the end of a leaf and eat the inside, the leaves fastened with white silk.

Penultimate stage. Head pale testaceous, mouth broadly brown, eye black, a curved black line behind it on lower angle of cheek reaching round to near vertex and perfectly visible through the transparent cervical shield when the head is retracted; width .4 mm. Body cylindrical, rather thick, translucent whitish, food green. Segments obscurely annulate; tubercles colorless but rather distinct, small; iv + v.

Last stage. Head faintly brownish, sutures of clypeus brown and a line on posterior edge of lobes, blackish; width .6 mm. Cervical shield large, faintly testaceous, transparent. Body translucent, shaded with pale slate over the sides and dorsum of joints 10 and 11; ♂ glands brown ringed as if segmented. Anal plate transparent. Hair tubercles black. Tubercles iv + v. Spiracles black; tracheal line visible, food green. Setæ pale, moderate. Skin minutely dusky granular. The ♀ glands are broad white bands in joint 10. Male larvæ when ready to spin had the glands dark vinous; body waxy white, sordid tinted; food a narrow, dark, sinuous line.

Episemus argutanus Clem. The larvæ occurred on the *Euphorbia heterophylla* which is a common plant in waste places. They bend up a young leaf on the upper side and fasten it with white silky web at the edges, the under side of the leaf forming the outside of the abode so formed. The leaves so fastened become much distorted with growth and folded between the veins which are firmly held by the silk. The larva eats off the terminal end of its abode, keeping it closed with silk, and later forms a new one.

Larva. Head rather elongate, pale greenish brown, showing two black spots on the ocelli and a narrow line posteriorly on the lower angle of cheeks; mouth brown; finely dark lined on labium; width about .7 mm. Body moderate, tapering a little at the ends, not elongate; colorless, transparent, the blood faintly green, food dark green; cervical shield concolorous; anal plate faintly brown. Thoracic feet black, except at base; abdominal ones short, not colored. Tubercles faintly brownish, rather small, the central hair tubercle black; iv + v; iii on joint 12 situated almost

before the spiracle. Segments very obscurely 3-annulate; skin minutely spinulose.

The larvæ pupated in a folded leaf.

Epiblema perplexana Fern. Not uncommon at light; seven examples furnished Prof. Fernald's types.

Gelechiidæ.

[The following notes on the Tineid larvæ are seldom complete, as it was impossible to fully examine the slender material collected without destroying some larvæ, which would have endangered successful breeding. Mr. August Busck has determined all the species.]

Aristotelia ivæ Busck. My notes are as follows: They do not seem to agree with what Mr. Busck has published (Proc. U. S. Nat. Mus., XXIII, 226), but it is probable that my larvæ were immature. All the material was sent to Mr. Busck and I did not breed this species myself.

Larva. In a soft web among the terminal leaves of *Iva frutescens* resting in the web. Head rounded, held out flat, vertex scarcely under joint 2; green, brownish shaded over the apices of the lobes, ocelli black; width .6 mm. Body slightly flattened, subventral fold prominent, segments obscurely 2-annulate; green, venter entirely so, dorsal half thickly, faintly mottled with sordid, leaving subdorsal lateral and stigmatal dotted lines of the ground color. Tubercles small, dusky; setæ moderately long, i and ii in line, iv and v approximate but separated by the diameter of a tubercle or more, in line; vi on the green lower subventral fold. Legs very slender, small, normal. Cervical shield greenish, not cornified, brown marks before it; anal flap concolorous. Incisures distinct, slightly folded.

Aristotelia sp. Mr. Busck has so determined a single specimen that came to light; the species may be new, but the material is too scant.

Nealyda pisoniæ Busck. The mines of this species were not uncommon in the leaves of *Pisonia aculeata.* They are on the upper side of the leaf, starting at the midrib, gradually and irregularly widening to form a large trumpet-shaped blotch, the larval frass contained. The larva escapes by a hole. The head is small, flat, partly retracted. Body flat, segments moniliform, joints 2 and 3 large, 4 to 11 almost alike, then gradually smaller, tapering posteriorly. Translucent testaceous, edges of the segments darker, brownish; food green; no spots. Thoracic feet short, normal, projecting, colorless, the basal piece slightly infuscated. Abdominal ones on joints 7 to 10 long, slender, tapering from a slightly large base, the tips swollen and bearing a few

rudimentary crochets in a single row. No anal feet, their positions indicated by slight elevations.

Nealyda kinzelella Busck. The mines of this species were rarely found in the leaves of *Pisonia obtusata* where they tend to produce a red discoloration, often bordering the mine, especially when old. But very few living larvæ were found. Head flattened, pale brown; clypeus high, but not quite touching the vertical triangle; labrum and clypeal sutures dark brown. Body flat, joint 2 wide, 3 and 4 a little smaller, 5 to 11 about equal, 12 and 13 tapering. Segmental incisures well marked, the segments a little angularly widened laterally. Cervical shield large, bisected into two triangular halves, blackish purple with a few pale dots. Body whitish at the sides, with a broad diffuse purplish dorsal band, paired round white spots on joints 3 to 12, very small on 5 and 12, the others large. Later this marking fades and the body becomes all yellowish, only the cervical shield dark. Feet bent in arcs like *N. pisoniæ*, their number not observed, but probably as described by Busck for the preceding species, those of joint 13 lacking. The mine is on the upper surface of the thick leaf, but the larva emerged by a hole on the under side at maturity.

Aproærema crotalariella Busck. The larvæ occurred on the *Crotalaria pumila* growing near the sea. Head rounded, flat, clypeus high, triangular, just touching the apical triangle; whitish, eyes black in a dusky band which runs along the lower angle of the lobe. Body short and thick, thickest centrally, the ends distinctly smaller; joint 2 small with large transparent cervical shield, a large black spot on the lateral angles and tiny pair on the posterior edge subdorsally. Anal plate dusky. Body white, translucent, food a narrow green line; ♂ glands in joint 9 very large, dark purple. A series of rounded patches of dark vinous on joints 3 to 13 anteriorly, subdorsally before tubercle i, stigmatally behind iii and spiracle, subventrally, small, behind iv+v. Tubercles small, brown-black; on thorax ia and ib separate, iia+iib, iv+v; on abdomen i dorsad to ii and rather approximate, iv+v. Feet short, normal; thoracic ones black except at base. Tubercle vi with a slight vinous patch, vii with a patch on one tubercle. Crochets of feet black on a circular planta, the ring broken without and within. On joints 3 and 4 the stigmatal vinous patch is before tubercle ii and covers also iv+v; on joints 11 and 12 the stigmatal and subventral patches are also united.

Aproærema sp. A single collected specimen.

Gnorimoschema terracottella Busck. The larvæ were found feeding in the leaves of *Iva imbricata*, growing actually on the ocean beach. The following are my notes: Mining about in the thick fleshy leaves with a more or less distinct hole at the end of the mine, sometimes the leaves more or less webbed up or the

terminal leaves united. Head flattened, clypeus high but not reaching vertex, brownish luteous, the sutures of clypeus brown, mouth brown, eye black with a blackish line along the lower angle of cheeks; width .5 mm. Body cylindrical, plump, incisures distinct and a little folded; cervical shield large, incised at the posterior angles, shining brownish luteous. Body yellowish, moderately opaque, food faintly green. Segments not distinctly annulate, shining, subventral fold moderate, joints 12 and 13 tapering, anal plate scarcely cornified but setose. Tubercles minute, brownish, setæ pale and obscure except at the extremities. Tubercle i dorsad to ii; iii above and before the small, round, brown-rimmed spiracle; iv + v anteriorly on the subventral fold, one obliquely above and before the other; vi posteriorly on the lower subventral fold; vii of three setæ in a triangle on the anterior leg base. On joints 3 and 4, ia and ib separate, iia + iib, iv + v, vi single. Skin minutely granular. Feet small, normal, crochets of those of joints 7 to 10 in a complete circle, of 13 on the anterior half of the planta.

See remarks under *Tortrix ivana* the larvæ of which may resemble this.

Gelechia sp. Five captured examples, representing five different species, are so labelled by Mr. Busck.

Ypsolophus eupatoriella Chamb. (*dolabella* Zell.) Was collected at light.

Ypsolophus sp. An example at light.

Trichotaphe melantherella Busck. The handsome and very active larvæ of this species occurred on the *Melanthera deltoidea* growing in grassy places. The larva lives solitary in a leaf sewed up with white stitches, once folded, not rolled. It feeds through to the lower epidermis. At the slightest touch the larva rushes out part way from one end of the leaf shaking its head rapidly with the throacic feet extended in a fierce attitude, which is intensified by its bright colors. On further disturbance, the larva will spring to the ground very actively, even leaping when actually touched. The young larva has the head luteous, eye black. Body all whitish, food green, a faint orange shade on joints 3 to 6, darkest on joints 5 and 6. Setæ black, tubercles obsolete. In the last stage the mature colors are definitely assumed. Head elongate, smooth, the vertex under joint 2; clypeus moderate but the paraclypeal pieces reach vertex; antennæ rudimentary; brown, shaded with black on the vertex and posterior angles; mouth dark, ocelli pale on a black ground; width .7 mm. Body slender, flattened, moliliform, tapering posteriorly, joints 3 and 4 somewhat collared. Thoracic feet large, angularly jointed, black; abdominal ones small, normal, slender, stretched out laterally, the circle of crochets broken on the outer side narrowly. Cervical shield large, brownish, broadly black edged posteriorly later-

ally and with two patches before. Joints 2 to 6 deep vinous, a conspicuous lumpy white fold in the incisure of joints 2–3 and 3–4; joints 5 and 6 dorsally black banded, 6 the heaviest; tubercles black; joints 7 to 13 opaquely whitish, a curved black band across before tubercle i ending at tubercle vi; one across tubercle ii, ending stigmatally posteriorly; on joint 9 all united in a large sooty patch, on joints 10 to 13 somewhat confusedly mottled and becoming olivaceous laterally. Incisures olivaceous mottled, segments whitish. Anal plate dark olivaceous; venter pale; tubercles and stiff setæ black. Tubercle i dorsad to ii, iv and v approximate, in line longitudinally; vi distinct; vii of three tubercles in a curved row, not a triangle. On thorax ia and ib separate, ia anterior; iia + iib, iv + v; prespiracular tubercle of joint 2 elongate.

Trichotaphe condaliavorella Busck. The larvæ are leaf stitchers, living between leaves of *Condalia ferrea*. The naturally overlapping portions of two leaves are united by short stitches, the larva eats on both sides in little patches. The leaf turns yellowish and is usually moist from dew or rain and gathers lice after the larva has left it. When large, the larva unites two leaves by their edges.

Stage, head .3 mm. wide. Head rounded, slightly bilobed, free from joint 2, clypeus two-thirds to vertex; lobes full; luteous, mouth dark brown; ocelli forming a black patch. Body uniform, joint 13 slightly smaller; segments folded annulate, but not regularly nor distinctly; subventral fold distinct; incisures well marked. Cervical shield large, shining, nearly rectangular, the posterior corners a little rounded; anal plate not cornified. Feet normal, the abdominal ones slender but short, crochets in a single row, the circle narrowly broken without. Translucent whitish or yellowish, food green; feet pale. Tubercles minute, a slight shining ring about the hair tubercle; i dorsad to ii, iii superstigmatal, iv and v in line on subventral fold, remote, vi posterior on lower fold, vii on leg base anteriorly. On joints 3 and 4, ia and ib separate, iia+iib, iv+v; on prothorax the shield complete and the other tubercles normal.

Stage, head .6 mm. wide. Head flattened, clypeus reaching vertex, lobes full and bulging; brown-luteous, ocelli black. Body long, slender but uniform, flattened, segmental incisures not strong. Pale green, translucent, food dark green. Cervical shield greenish with black lateral rim; a large black dot on tubercle ii on joints 3 and 4; anal plate pointed, dusky margined posteriorly. Tubercles minute, black, iii of joint 12 larger; iv and v united, vi and vii normal. Setæ long black, those of the anal plate conspicuous.

Last stage. Head round, slightly bilobed, flat; reddish luteous, the labrum whitish, jaws black, eyes black centrally; width 1.2 mm. Body flattened, whitish green; a green, less opaque dorsal and subdorsal stripe, a black longitudinal dash laterally on joints 3 and 4. Anal plate pointed,

brownish, shaded with black at the rim. Feet normal and somewhat outstretched, tipped with smoky. Tubercles small, black, iii the largest, iv and v contiguous. On thorax ia and ib well separated, iia and iib contiguous in the black patch. The contiguous tubercles practically touch, but are not encircled in a common chitinous area. Setæ long, black, stiff. ♂ glands pale yellowish.

Anacampsis laguncular iella Busck. The larvæ are leaf tyers, occurring commonly on the "white mangrove" (*Laguncularia racemosa*) growing on the shores of the lake. The leaves are firmly united by threads.

Penultimate stage. Head black, shining, paler over the clypeus; mouth pale; width .8 mm. Cervical shield large, black, scarcely bisected; anal plate smaller, blackish luteous. Body sordid translucent, ochraceous tinted. Segments smooth, the incisures folded, feet normal, short. Tubercles small, blackish, iv+v, setæ long, pale. On joints 3 and 4, ia very small, separate from ib, iia+iib, iv+v; i and ii of abdomen nearly in line.

Last stage. Head rounded, clypeus high but not reaching vertex, epicraneal lobes extending to the back of the head without membraneous vertical triangle; primary setæ present, pale. Color as before but the body sordid white, translucent, not ochraceous; joint 2, except the cervical shield, vinous; tubercles of joint 2 dark. Thoracic feet black except the base and joints. Spiracles minute, brown ringed. Segments obscurely 3-annulate; subventral folds double. Tubercles colorless, the hair-tubercles brownish. ♂ glands in joint 9 large, brownish. Anal plate concolorous with body, with black punctures.

Anacampsis argyrothamniella Busck. The larva of this species was first observed on Anastasia Island, St. Augustine, Fla., near the ocean. Afterward I met with it at Palm Beach, also near the sea. It sews up the leaves of *Argyrothamnia blodgettii* on the upper side, uniting them by the edges and eats the inner portion. Last four larval stages observed with widths of head .4, .55, .8, and 1.1 mm.

Head shining black, the clypeus reaching vertex, paraclypeal pieces, apex of clypeus and labrum pale at maturity, in earlier stages head all black. Body cylindrical, the last segments much tapering, feet slender, normal. Slightly greenish white, streaked with white about the tubercles. Tubercles large, black; i dorsad to ii, iv + v, vii of three setæ in a distinct black tubercle; on thorax ia + ib, iia + iib, iv + v in line with iii, vi as large as the others. Anal plate pale, dusky on the lateral edges. Pupa obtect, the cases united, the tongue forming a slight angle below. Black, the cases shining; abdomen dull. Three movable incisures broadly and the joinings of the wing cases narrowly pale brown.

Glyphidocera floridanella Busck. This is an undescribed species taken at light which Mr. Busck intends to describe in a

forthcoming paper, "A Revision of North American Gelechiidæ." He has handed me the following, so that the species might be included here:

G. floridanella n. sp. Antennæ four-fifths of fore wing, light brown on the under side, dark fuscous on the upper, in ♂ slightly serrate and deeply notched on upper side of the joint next to the basal one, in ♀ serrate but without the notch. Labial palpi long, recurved, smooth, somewhat compressed laterally, sharpened in front, the third joint two-thirds as long as the second; dark bronzy fuscous. Maxillary palpi obsolete. Tongue stout, scaled. Head and thorax blackish fuscous, face a shade lighter. Fore wing with ground color light yellowish fuscous, thickly overlaid with dark blackish brown and with a purple sheen. The dark scales segregate into large, ill-defined patches, one occupying nearly the entire basal third of the wing and most prominent at dorsal basal third; another forming an obscure transverse band across the wing at the apical third, and a third occupying the apical portion of the wing. The intervals between these patches show the lighter ground color sprinkled with numerous single dark scales.

Venation: Eleven veins in fore wing, vein 8 absent, 7 to costa, 2 and 3 stalked. This seems a more natural explanation than the one given by Lord Walsingham in the description of the genus.

Hind wing dark gray, twice as broad as the fore wing, termen slightly sinuate.

Venation: Eight veins, 3 and 4 stalked, 6 and 7 stalked.

Legs shining yellowish fuscous, shaded with darker fuscous. Expanse 13.5 to 15 mm.

U. S. National Museum, type no. 5363. Described from two ♂♂ and one ♀.

This remarkable genus, described from the West Indies, has not hitherto been recorded from the continent. I have, however, observed with pleasure another species of it while examining Chambers' types in the Museum of Comparative Zoology, at Cambridge, Mass. It is his *Gelechia æquepulvella*. From the short indefinite description (Can. Ent. IV, 192, 1872), no one would suspect that Chambers had before him specimens of this characteristic genus. It is strange that he did not notice the peculiar antennal structure of the male. However, eleven specimens, labelled by Chambers and agreeing with his description exclude all doubt of the identity of the species. One of these specimens, a ♂, bears Walsingham's blue label No. 1006, referring to a notebook which I have seen through the kindness of Prof. C. H. Fernald, in which the specimen is identified as *G. æquepulvella* Chamb. The male genitalia in Chambers' species are very large and highly developed, as are also the same parts in the comparatively smaller *G. floridanella*. These structures may ultimately

be of assistance in distinguishing the similar species of this genus when it is practicable to examine them. I have met with two other species of this genus in single collected specimens.—August Busck.

Œcophoridæ.

Depressaria amyrisella Busck. The larvæ were found on the very young leaves of the "torch-wood" (*Amyris floridana*), which, at the time of unfolding, are colored deep red. The larva spins up one of the leaflets neatly, folding it together on the upper side, united around the margin, with a rounded hole at the petiole which is made circular with silk. The larva goes out to feed on another leaf.

Head round, full in front, bilobed, almost cordate, narrowing below but the mouth broad; antennæ moderate, clypeus rather high, but the sutures obscure, not depressed; shining black, mouth brownish; setæ pale; width .6 mm. Body cylindrical, the segments folded 3-annulate, colorless, yellowish, the food green. Cervical shield weakly cornified, pale orange; thoracic feet rather large, pale. Tubercles minute, setæ small, dark. On thorax ia small, separate from ib, iia + iib, the former small, iv + v; on the abdomen iv and v closely approximate, in line, v small. No anal plate; feet short, normal, with tubercle vii on the anterior outward base. Abdominal tubercles with slight dusky areas about the hair dots. Later the larva was all shaded with red except the anterior edge of joint 2 and the anal feet. Pupa in a cocoon in the leaf, brown.

Blastobasidæ.

Blastobasis guilandinæ Busck. The larva bores in the young growing stems of the *Guilandina bonducella*, forming a burrow in the center of the wood, the frass collected in masses at a small hole at the end of the burrow, usually at the base of a leaf. My attention was first called to this larva by Mr. Kinzel.

Head rounded, bilobed, vertex under joint 2, held out flat; rather flat before, smooth, shining, light brown, a black line on the posterior angles of cheeks back from the ocelli; sutures of clypeus and jaws dark brown; paraclypeal pieces reaching vertex; width .8 mm. Body robust, slightly flattened, incisures slight; feet short, normal; cervical shield transparent, faintly luteous, divided by a paler dorsal line. Segments faintly 3-annulate dorsally; tubercles small colorless; i dorsad to ii, iv + v, vi present, normal, vii of three setæ in a wide triangle; on thorax ia and ib, iia and iib, iv and v approximate; setæ moderate, pale; spiracles round, black-rimmed. Skin minutely granular shagreened.

Yponomeutidæ.

Plutella maculipennis Curt. Several examples at light and some were raised by Mr. Busck from larvæ sent him, presumably

feeding on the "Shepherd's purse" (Bursa) which was growing in waste places.

Hemerophila dyari Busck. I have given my notes on this larva accompanying Mr. Busck's original description. (Journ. N. Y. Ent. Soc., VIII, 243, 1901.) It feeds on *Ficus* spp.

Atteva gemmata Grote (*floridana* Neum.). Larvæ in webs on *Simaruba glauca* in 1890; none seen in 1900, but the moths began to appear late in February. (Description in Journ. N. Y. Ent. Soc., V, 48.)

ELACHISTIDÆ.

Coleophora sp. Two examples of a curious case were found on Eugenia sp., corresponding to *C. octagonella* Wals., but no moths were bred. The case was long and pointed at one end, resembling a thorn, roundedly 10-sided, overlaid with elongated pieces of frass laid on regularly; at the open end a group of loose frass fastened in webby silk.

Homaledra heptathalama Busck. The larva occurred solitarily in peculiar nests on the leaves of the palmetto trees (*Sabal palmetto*). The nest consists of a thick felted mass in the angle of the leaf on the under side, composed of silk and comminuted frass (palmetto fibre) arranged in eight rounded chambers, slightly overlapping and connected, successively larger, the first about .5 mm., the last 8 to 10 mm. in diameter. At the end an irregular mass of loose fibre and the whole overspread by a loose, distant net of fine silk, covering also the area where the larva feeds. The pupa is formed in the last large chamber.

Head round, slightly bilobed, clypeus not reaching over half way to vertex, depressed at apex; free from joint 2; pale testaceous, jaws brown, ocelli small, black; width 1.6 mm. Body flattened a little ventrally, incisures well marked, of uniform width; segments smooth, subventral fold moderate; joints 2 to 4 rather folded. Cervical shield very slight, luteous, nearly membranous. Opaquely whitish, dotted with transparent specks. Tubercles minute, except iii, which is large and pale luteous. i dorsad to ii, iv + v. Joints 12 and 13 smaller, 13 strongly folded anteriorly; anal flap conical, membranous, concolorous. Dorsal vessel dark. Setæ fine, brownish; feet short, normal.

Homaledra sabalella Chambers. The larvæ occurred gregariously on the back of the leaf of the *Sabal palmetto.* They eat a wide irregular patch over the leaf, covered with a mat of loose web and comminuted frass, reaching down into a point of the leaf, which becomes dead, curled and filled with the small, webby cocoons. At maturity the larval head measures 1.0 mm. A little larva with the head .3 mm. wide had head and cervical shield jet black, the rest of joint 2 in front pale vinous. Skin transparent,

densely mottled with purple pigment, leaving a straight, pale dorsal line. Tubercles small, black; setæ long, pale, dusky. Feet normal, short; thoracic ones dusky. Tubercles a little elevated.

Antispila eugeniella Busck. The larvæ are leaf miners in Eugenia (probably *E. procera*). The mine starts in the substance of the leaf, rapidly widens to a blotch, and finally the larva cuts out a case, slightly constricted centrally. The larva is rather short and thick, not moniliform, colorless, the head retracted apically, dark; a dark spot behind it.

Cosmopteryx ipomœæ Busck. The larvæ are leaf miners in "morning glory" (Ipomœa sp.). The mine is an irregular series of blotches and lobes, usually elongate and several partly joined; taking all the parenchyma between the two epidermes, the skin strengthened by web, so that the surface is wrinkly. Frass partly ejected, held to the leaf by a close web.

Penultimate stage. Head flattened, rounded, quadrate, clypeus rounded above; greenish, brown on the margin, eye black, jaws brown; width .4 mm. Body flattened, subventral fold prominent; abdominal feet on joints 7 to 10 short, rather broad, all alike and equally remotely spaced, the crochets rather numerous in an ellipse; anal feet approximate, crochets in a line. Thoracic feet small, curved. Segments 2-annulate, the segmental incisures marked, both these and the annulet incisures less opaque than the body. A narrow longitudinal, lateral, transparent crease, interrupted by the incisures. Venter 3-annulate; subventral fold double on joints 5 to 11, not crossing the annulets; joints 12 and 13 tapering. Cervical shield large, flattened, semicircular, hard, but concolorous; anal plate as large as the segment but actually small. Translucent whitish, alimentary canal green; ♂ glands in joint 9 large, annulate, showing four segments. A group of setæ before the leg (vii), a tubercle with very minute, rudimentary setæ near center of lower subventral fold (vi), two setæ and tubercles close together in anterior part of upper subventral fold a little before spiracle (iv + v), the anterior one very small; spiracle round, iii above and before it, i and ii nearly obsolete, showing as slight scars. Seta iv is the only distinct hair; iii and v are present on thorax. Skin finely reticular shagreened.

Last stage. Head flat, mouth projecting, eye black, mouth brown; width .6 mm. Body and head whitish, a broad dorsal and lateral dark red band on joints 2 to 13 and a faint narrow one on the subventral fold in the center of the body. Otherwise as before. Cervical shield semicircular, the dorsal red stripe staining it posteriorly. Lateral stripe with minute pale dots. Setæ moderate, pale.

Spun a fine silken cocoon between leaves or in a folded leaf.

Cosmopteryx nigrapunctella Busck. A specimen at light.

Cosmopteryx lespediza Wals. Also collected at light.

Scelorthus pisoniella Busck. This little larva, living on the backs of the leaves of *Pisonia obtusata* has already been described (Journ. N. Y. Ent. Soc., VIII, 240, 1901).

Lamprolophus lithella Busck. The larva bores in the young stems of *Pisonia aculeata.* I have described it. (Journ. N. Y. Ent. Soc., VIII, 241, 1901.)

Cycloplasis panicifoliella Clemens. Dr. Clemens has described the mine. The larvæ occurred commonly on *Panicum divaricatum* in January, several together in the same leaf, the mines forming a lot of parallel lines directly towards the apex. When enlarged into blotches, frequently several are confluent and the larvæ in a common mine. At maturity the circular pieces of the epidermis, 3.2 mm. in diameter, are cut out, folded in the middle and used as cocoons.

Head very flat, the clypeus high, touching the vertical triangle; pale luteous, sutures and mouth brown, a black and a brownish ocellus; half retracted in joint 2. Body translucent, whitish, the dorsum very flat, the venter much more rounded; segments moderately moniliform; joints 2 and 3 large, 4 a little smaller, 5 to 13 about alike, 13 a little smaller, divided. No feet. A large, rounded, black shield on the venter of joint 2. Setæ obsolete; no tubercles.

TINEIDÆ.

Nepticula condaliafoliella Busck. The mine is formed on the upper side of the leaves of *Condalia ferrea.* Linear, gradually widening, starting from the margin, much convoluted and directed finally toward the center. The mine is short, compactly folded; the frass forms a central black line.

Larva green, moniliform, with band-shaped clypeus. Thoracic feet on joints 3 and 4, abdominal ones on 6 to 11; joint 13 bulbous truncate, small, no feet. A black patch within behind the head.

Nepticula myriçafoliella Busck. The larvæ form mines on the upper side of the leaves of *Myrica cerifera.* The mine starts at the midrib or elsewhere on the leaf, gradually widening, usually contorted, but rarely quite straight.

Nepticula sp. A single specimen at light.

Leucoptera erythrinella Busck. The larvæ are leaf miners on the upper side of *Erythrina herbacea*, very common, frequently causing serious injury to the plants, many mines in nearly every leaf. The mine is narrow, but soon widening to a moderate blotch; finally visible below, the leaf being killed through. The larva escapes by a hole in the mine above. Somewhat flattened, the segments moniliform; joints 2 and 3 wide, 4 narrow, 5 to 10 a little wider and about equal, 11 and 12 successively smaller, 13 elongate, narrow. Colorless, greenish, the food dark

green. Head transparent, mouth brown; flattened, pointed, the clypeus band-shaped and reaching vertex, but narrowed a little above; ocelli present, blackish. No feet. Setæ present only laterally.

Leucoptera guettardella Busck. Mr. Busck has described the mine, on the under side of the leaves of *Guettarda elliptica*. The larva is flat, the head retracted, the mouth brownish; clypeus band-shaped, pointed above, divided from the broadly triangular vertex. Segments widened, flat, joint 2 wide, 3 less so, 4 small, 5 to 9 a little larger, 10 to 13 tapering. Colorless, food green, edges of segments darker. Thoracic feet small; abdominal ones on joints 7 to 10 and 13 small, without hooks. Tubercles absent, setæ obsolete. The larva turned dark vinous and left the mine to spin its cocoon.

Leucoptera n. sp. A single specimen at light.

Podiasa chiococella Busck. The larva forms in the leaves of *Chiococca racemosa* a long linear mine, only slightly widening, suddenly expanding to a large blotch that may cover part of the old mine. The larva is long, slender, and flattened with strongly moniliform segments. Head round, flat, about half as wide as joint 2; joint 2 transversely elliptical, projecting at the sides; 3 and 4 small; 5 to 10 larger and about equal, 11 to 13 tapering. On joint 2 a quadrate shield, excised at the sides, the posterior angles produced laterally like curved horns. A dorsal and a ventral round black patch on joints 3 to 13, those of joints 3 and 4 small, the rest corresponding with the size of the segment. No thoracic feet; abdominal feet on joints 7 to 10 short and stumpy, without hooks.

Before leaving the mine the larva is markedly transformed. (See Busck, Proc. U. S. Natl. Mus., XXIII, 241.) All dark vinous, shining except a large white spot on tubercle iii, the row of spots obscurely connected into a band by a shade that is distinct posteriorly. Head round, slaty black, clypeus reaching vertex, triangular, not much flattened; cervical shield broadly white. The lateral white spots on joints 3 and 4 contain tubercles iii, iv, and v, with iia and iib, which are approximate. On the abdomen tubercle i is dorsad to ii, iv, and v in line, rather remote and on the posterior part of the segment; vi distinct subventrally; vii on the leg. Setæ black, distinct. Thoracic feet short, pale. Abdominal ones on joints 7 to 10 and 13, but the anterior pair short, not functional in walking, so that the larva is a semilooper. It walks about freely seeking a place to spin its cocoon.

Coptodisca condaliæ Busck. This larva mines the leaves of the "break-axe" (*Condalia ferrea*), as described by Busck. It has the head small, flat, higher than wide, the epicraneal lobes rather full, touching centrally as if dividing the clypeus into a

highly triangular lower part and small triangular apical portion. Mouth slightly pointed; antennæ very small; ocelli not seen. Joints 2 and 3 wide, 4 smaller, 5 to 13 about equal, 14 broad, rounded, with a ventral plate notched at the end, the two lobes rounded and slightly upcurved. No thoracic feet, the venter of joints 2 to 4 flat, roughened, with paired circular areas representing the feet. Abdomen without feet, the subventral folds prominent; joints 7 to 10 with median elliptical white areas, 12 with a smaller paired but similar area and a longitudinally elliptical one on joint 13. Skin smooth, dull, pale leaden, brownish on thorax and ventral plate. Body flattened dorsally, finely shagreened; no shields. Dorsal tubercles obsolete, represented by obscure impressed areas; lateral hairs rather distinct, pale. The larva lives in the mine with the ventral surface uppermost.

Coptodisca sp. Mines very similar to the preceding on the upper side of the leaves of *Myrica cerifera*. The cases are cut out in the same way. Mr. Busck did not determine the insect specifically.

Bucculatrix ivella Busck. The larva at first mines the leaves of *Iva frutescens*, a linear, gradually widening mine with a black central stripe of frass except at the tip. The mine starts at the petiole and runs nearly to the tip of the leaf, slightly flexuous. The larva comes out at the end and spins a delicate, circular web with a central semicircular hole in it, in which it rests curled. Larva a little flattened, segments slightly moniliform, subequal, scarcely tapering. Pale yellow with a green tint, not shining. It sheds its skin in this web, leaves it and becomes free-feeding on the young leaves. Slender, somewhat moniliform, a little depressed at the ends. Whitish translucent, the food green; ♂ glands orange. Tubercles large, white, setæ black. Tubercle i dorsad to ii, iv and v very remote, iv dorsad, suggesting the Noctuid type excepting that it is very far posterior of the spiracle, vi on the lower subventral fold. On thorax ia and v absent; iia + iib. Cervical shield brown dotted, with black setæ. Head pale, mouth pointed, eye black, clypeus high. Spins a ribbed white cocoon on the stem or leaves of the plant.

Bedellia minor Busck. The larva mines in the leaves of the "morning glory" (Ipomœa sp.). The early mine is a slender irregularly sinuate line under the upper epidermis gradually widening to the end where the larva emerges to begin blotches elsewhere. The frass is contained as a long, dotted, central line. Later there is a slight open web on the back of the leaf, the larvæ feeding as miners but ejecting the frass by a hole. A large blotch is formed, nearly symmetrical, sometimes lobed.

Head broad, flat, half retracted in joint 2, shining greenish with a brown tint, mouth brown. Cervical shield quadrate, rugose, shining greenish.

Body slender, segments moniliform, joint 12 smaller, sharply noniliform, 13 small and slenderer. Thoracic feet large, pale; abdominal ones very small, slender, close together on joints 8, less so on joint 9, more separate on 10 and remote on 7; a longer pair on joint 13; crochets few in a circle. Setæ i moderate, ii minute, posterior, iii small, iv large, substigmatal, a little posterior; a tiny seta (v?) just above vi; vi large, somewhat anterior; vii small on base of leg; viii within. On thorax iii and v are present. Translucent whitish green, food dark green. Anal plate shield-like, rugose, blackish on the lateral edges. Dorsal vessel with whitish edges.

At maturity the larva is pale green, a dorsal, a broad geminate lateral and faint subventral dark red lines. Pupation in a delicate web remote from the leaf. The pupa resembles a seed, a point in front, cases nearly reaching the cremaster.

Metriochroa psychotriella Busck. The larva mines the leaves of the "wild coffee" (*Psychotria undata*) as described by Busck. Head rounded, prominent, the labium a broad, even band to base with small spinneret and palpi at tip; labrum moderate, clypeus a broad band extending to vertex and not narrowing; lobes full; antennæ colorless; no ocelli; a few rudimentary setæ; translucent yellowish. Body flattened moderately, round, tapering much behind, not so before; segments moniliform. Joint 2 wider than head, without shield; 3 still wider (setæ ia and ib fairly distinct on joints 3 and 4); joints 4 to 10 about equal, 11 to 13 tapering, the latter divided by a strong suture. No plates; no dorsal setæ on the abdomen. Skin finely granula, not annulate nor creased. Thoracic feet absent, represented by three pairs of smooth circular plates. Abdominal feet represented by narrow concave ellipses containing brown spicules on joints 6 to 10 and a terminal median patch on joint 13 posteriorly with a seta on either side. Color translucent whitish with a yellow tint. No setæ except on the thorax and joint 14.

Marmara guilandinella Busck. The larvæ mine the stems of *Guilandina bonducella* under the epidermis of the bark, a linear, widening, irregular, wavy and recurving mine, white at first with central dark line of frass; later turning brown.

Lithocolletis verbesinella Busck. The larvæ form mines on the under side of the leaves of *Verbesina virginica*, blotch-like, a little swollen and red above, membranous below, finally sewed up into longitudinal furrows. A white cocoon slung in the hollow of the mine. The larva has the head flattened, the vertex under joint 2, clypeus high and not narrowing much till above the middle, nearly touching the vertical triangle; mouth prominent, brown, ocelli black. Body whitish, no marks.

Lithocolletis sp. A single collected specimen.

Coriscium randiella Busck. The larvæ mine the leaves of

Randia aculeata on the upper side, the mine marginal or becoming marginal, yellow, forming a large blotch sometimes obscuring the early linear part of the mine. The epidermis becomes a little swollen and succulent, and towards maturity the larva eats out all or nearly all of these succulent cells, leaving the mine slightly bladdery with thin brown skin. The larva emerges and spins a white cocoon on an adjoining leaf.

Larva not strongly flattened, moderately moniliform, without marks. Head retracted, flat, clypeus triangular, reaching vertex, luteous, mouth brown. Joint 2 flattened above, transparent, no plates. Thoracic feet rather large and prominent; abdominal ones on joints 7 to 9 and 13. All light yellow, not shining.

Chilocampyla dyariella Busck. The larva forms curious mines in the leaves of *Eugenia buxifolia* and *E. procera* as remarked by Busck. The mine is really almost a gall, as it is formed in the young leaf which grows in a modified manner. The early mine is narrow, slightly wavy and uniform about .5 mm wide; it starts in the leaf and runs all about the margin on the under side, often nearly around the leaf. The epidermis is whitish but the leaf is unchanged by this part of the mine. At the end the larva proceeds to the middle of the leaf where it forms a large, bladder-like hollow that finally occupies nearly the whole of the leaf. The two surfaces are swoollen a little, gall-like, succulent, pale yellow or red. The space divides the midrib, half of it going with either surface of the flattened bladder. Finally the larva eats out more or less of the succulent cells and the frass accumulates in the hollow. The larva escapes by a hole.

Head rounded, not flat, apex under joint 2, clypeus nearly reaching vertex, unusually narrow; whitish, mouth broadly stained with brown; antennæ short; two large black spots on ocelli with a brown one between; setæ distinct, white. Body somewhat flat though the dorsum is rather well rounded. Entirely opaquish white without marks. Segments moniliform from dorsal view, a little irregularly creased, not annulate. Joint 2 large, the large shield concolorous; 13 small with moderate shield, faintly brownish tinted. Thoracic feet moderate, the anterior pair directed obliquely forward, the others lateral, 3-jointed, normal. Abdominal feet on joints 7 to 9 and 13, short and thick, without crochets. No feet on joint 10. Setæ white, some rather long, from very small tubercles. Tubercle iv has a large setæ, but the others are nearly indistinguishable.

Eucosmophora sideroxylonella Busck. The larvæ form mines on the upper side of the very young leaves of the *Sideroxylon pallidum*. Linear and slightly widening, finally forming a great blotch, the upper epidermis neatly split off. This soon becomes tight on the young growing leaf like a delicate membrane and curls the leaf, which is normal below. Membrane brown, longitudinally wrinkled, the leaf finally closing together. Then the larva eats the parenchyma to the lower epidermis.

Head rounded, apex under joint 2, a little flattened, clypeus highly triangular, narrow, just touching the vertical triangle, a little depressed; luteous, mouth brown, ocelli black. Body cylindrical, not tapering, incisures not deep, translucent, faintly yellowish. Thoracic feet short; abdominal ones sessile, on joints 7 to 9 and 13. Setæ pale, obscure; tubercles obsolete. On maturing the larvæ turn bright red and leave the mine to spin their cocoons.

Gracilaria burserella Busck. The larva lives on *Bursera gummifera*. At first it forms a mine starting next the midrib or large vein, broadly linear, finally widening into a subquadrate blotch bounded by the veins. The lower epidermis is thin; no sign of the mine above. Later the larva leaves this mine by a hole and folds over a part of the leaf near the petiole at the margin fastened with white webby stitches without. It lives concealed in this and eats out the epidermis and parenchyma. Forms a white cocoon on the back of the leaf.

Head bilobed, full, clypeus highly triangular, touching the small vertical triangle; shining, ocelli, black; mouth pointed; colorless. Body cylindrical, the feet large; abdominal ones on joints 7 to 9 and 13, large and distinct, none on joint 10. Segments equal, 12 and 13 a little smaller; segments with distinct incisures, 2-annulate. Whitish translucent, shields concolorous. Setæ rather long, pale; i dorsad to ii, iv and v in line quite remote, vi long, vii on leg base; on thorax ia + ib, iia + iib. Cervical shield large, semicircular; anal plate small.

Gracilaria sebastianiella Busck. The larva forms a mine on the back of a leaf of *Sebestiania lucida*, an irregular band-shaped mine with lobes in different directions, finally forming a large blotch with a long fold in the thin lower epidermis, sewed up with white silk. Below this the larva eats the thick upper side to the upper epidermis near one edge of the blotch.

Head round, the lobes full, clypeus triangular, high; brownish, ocelli black, mouth brown. Body nearly cylindrical, incisures well marked but not moniliform, not strongly tapering. Thoracic feet large, normal; abdominal ones strong and short, on joints 7 to 9 and 13. All colorless, whitish, food dark green, plainly showing. Setæ and tubercles obsolescent. Later the larva came out and folded up the whole end of a leaf into a neat triangular box and ate out the parenchyma. The box was held with bands of silk without and the edges sewed up; frass contained.

The larva comes out a small hole at the end and spins a cocoon in a similarly folded leaf, but a fresh one, with a hole at the corner for the emergence of the moth.

Gracilaria sp. A specimen at light.

Phyllocnistis intermediella Busck. The larva mines the leaves of *Sideroxylon pallidum* as described by Busck. Head

large, flat with projecting widened mouth. Body flat, the sides scalloped, joint 2 large, but not wider than the head, 3 equal, 4 small, 5 to 11 larger, 12 smaller, 13 long and narrow, tapering. Translucent, faintly greenish, food green ; no marks ; head colorless, the jaws brown.

Scardia sp. Many specimens at light.

Eucatagma amyrisella Busck. The larva lives in a web on *Amyris floridana*. I have given my notes on it with Mr. Busck's original description. (Journ. N Y. Ent. Soc., VIII, 247, 1901.)

Several other species of Tineids and one Geometrid were taken, but not in good enough condition to work up. Twelve larvæ, not referred to in the preceding part of this article, were noted, but not bred.

June 14, 1900.

The 153d regular meeting was held at the residence of Mr. Frank Benton, 1801 Harewood ave., N. W. President Gill in the chair, and Messrs. Caudell, Dyar, Ashmead, Morris, Vaughn, Chapin, Hay, Howard, Waite, Patten, Pollard, Benton, Heidemann, Kotinsky, Cook, and Currie, active members, and Prof. Trevor Kincaid, of Seattle, Wash., visitor, also present.

—Under the head of Short Notes and Exhibition of Specimens, Dr. Dyar showed a series of genitalia of Lepidoptera which had been admirably displayed by the work of a museum pest, Silvanus. Mr. Howard referred to a note which he had published in *Psyche*, Vol. IV, p. 132, in which he described similar work done by Trogoderma. Dr. Gill referred to the use of insects in preparing skeletons of mammals, and Mr. Kincaid said that in Alaska the work of Amphipod Crustacea was used in the same way.

—Mr. Caudell, apropos to Mr. Heidemann's statement that Capsids very seldom puncture the skin of human beings, exhibited a specimen of *Plagiognathus obscurus* Uhler, which had bitten him on the wrist.

—Dr. Dyar showed the second volume of Hampson's catalogue of the Lepidoptera Phalænæ, and referred to the fact that certain Nolas in India retained, in the larval state, the successive cast heads just as does the larva of *Harrisimemna trisignata* Walk. of the United States fauna. He also referred to the great enlargment of the lobe of the hind wings in the Lithosiid genus Bœnasa,

and the reduction of the rest of the wing. Dr. Gill thought that this character is of subfamily rank, to which Mr. Ashmead agreed. Dr. Dyar, however, considered it a case of peculiar distortion and of recent acquirement, and of no more than generic weight. Dr. Gill thought that we ought to express such great changes in our taxonomy. Dr. Dyar mentioned that wing distortions are common in the Lithosiidæ. Messrs. Cook, Vaughn, and Kincaid took part in the discussion which followed.

—The first paper of the evening was by Mr. Cook, entitled "Notes on Arthropods from Porto Rico." He showed specimens and photographs of the damage done by ants to an okra plant where the ants had eaten the fruit and bored holes in the leaves. The plants affected had enlarged foliage, which Mr. Cook attributed to the destruction of the fruit. He also showed photographs and specimens of a mealy bug on pineapple which had been attended by ants, and cultivated by them so carefully that they had built sand shelters over them. He also showed photographs of Termites' work, one species with nasuti forms building large nests known as "nigger heads." These Termites are indiscriminate as to the kind of trees they build on. The form occurring in houses in furniture is a Calotermes. He showed photographs of furniture damaged by them He showed also a new form near Hubbardia which is very likely a new genus. He also showed a Japyx, which is a new record for the West Indies. He stated that Myriapods are rare in Porto Rico. There are no Geophilids. The Spiroboli are common, however. Some bright colored forms occur which are gray with white and vermillion spots. The natives stand in terror of these creatures, calling them "gongoli," and think they have a deadly sting in the tail. This fear possibly arises from the abundant acid secretion of these Myriapods, which they are able to eject to a considerable distance. They climb about in the trees, and very few are found on the ground, which fact is accounted for by Mr. Cook on the ground that the soil is a tenacious clay which would cling to their bodies and possibly stop up the spiracles. In reply to a query by Dr. Gill, Mr. Cook said that he had been told that there were but three or four species of snakes on the island. Dr. Gill said that five species had been recorded, but that he had recently been told that there were none on the island at present, the mongoose hav-

ing exterminated them. Mr. Cook, however, said that the mongoose was still scarce on Porto Rico. Mr. Ashmead suggested that the Spiroboli might climb the trees to get away from their natural enemies, such as Pyrophorus.

—The second paper was by Professor Kincaid, and was entitled "Notes from Alaska." He spoke of his trip in 1897 on the Fur Seal Expedition, giving general remarks as to the forms collected. At Sitka he found several sawflies and a Psychoda previously described from Vancouver and Seattle. At Unalaska he found a rich collecting field, where, if the whole season were covered, good finds would result. He found there *Tenthredo nigrofasciata*, a form described in 1822, which he takes to be a Macrophya. On the Pribiloff Islands he found several species of beetles. Carabidæ and Curculionidæ were found under logs. In the tundra, or very deep moss, he found some interesting species by digging up the moss and shaking it over cloths. In digging post holes beetles fell into the holes from the tundra, and interesting forms were collected in this way. Among the Diptera, Muscidæ were very abundant. Syrphidæ, however, were rare, although there were many flowering plants. There were some Borboridæ which were of importance in fertilizing flowers, especially the Gentians. Among the Hymenoptera, *Bombus kincaidi* Ckll. was the most prominent, but there were numerous Ichneumonidæ and Chalcididæ, and one new sawfly. He noticed numerous galls on willows, indicating the occurrence of gall-making sawflies. There were very few Lepidoptera, and no butterflies among them. The forms consisted of an Arctian, a Noctuid and a few micros. A few spiders were found, but no orb weavers. There were two Myriapods and eight or ten species of Thysanura but only two Hemiptera, the one a Capsid and the other an Aphid. In his trip made in 1899 with the Harriman Expedition he found it interesting to compare the Pribiloffs with the Popof Island, where he collected rather thoroughly. In the latter place there were very few beetles. The absence of beetles he accounted for on the ground of the abundance of rodents. He found two butterflies. The absence of strong flying insects he accounted for by the prevalence of very severe winds. The flight of one of the butterflies had been very peculiarly modified, as he thought, by the strong winds. It could hardly be induced to fly,

and then only for a short distance and very low. In the valleys he found winged Tipulidæ, but as he climbed the mountains their place was taken by wingless forms, which he attributed to the action of natural selection, the winged forms at high elevations standing less chance to survive than those with aborted wings and incapable of flight, bringing about the gradual disappearance of the wings. He showed specimens illustrating several very perfect cases of mimicry between Bombus and certain Diptera.

Mr. Benton asked as to the occurrence of honey bees, and Mr. Kincaid replied that he found only Bombus and one Andrena.

Mr. Ashmead congratulated Mr. Kincaid on his admirable work in Alaska. The Russians had previously studied the Coleoptera of Alaska rather carefully, so that Mr. Kincaid had added only five forms to the fauna, one of them being new to science. In other orders, however, he had been highly successful. To the Hymenoptera, of which about 25 species were previously known, Mr. Kincaid had added about 75 species. In the Diptera he had discovered more than 100 new species, according to Mr. Coquillett. Mr. Ashmead anticipates, from the results of Mr. Kincaid's work, that if a careful observer could be stationed in the country through the whole season, the faunal list would be greatly enlarged.

Mr. Cook said that in the case mentioned by Mr. Kincaid the high-wind argument was better than it is in Madeira and the Canaries, concerning which it had been previously suggested by authors. Dr. Gill referred to the abbreviation of wings and the enlargement of feet of birds on small islands. In this case he thought that it was, perhaps, a reflection of the small size of the island, where short flights only were required. He also spoke of the novelty of the shell fauna of the Madeira islands, which he said afforded, together with other faunal features, a strong argument against the existence of the continent of Atlantis. Mr. Vaughan having spoken of corals common to Madeira and the West Indies, the discussion drifted into a consideration of the connection between the continents of Africa and South America in geologic times.

—The next paper was by Mr. Howard and was entitled "Economic Entomology in Canada." The speaker referred to a recent visit to Ottawa and described the work being done under

the experimental farm system by the very efficient Dominion entomologist, Dr. James Fletcher.

OCTOBER 4, 1900.

The 154th regular meeting was held at the residence of C. L. Marlatt, 1440 Massachusetts avenue. President Gill occupied the chair and Messrs. Busck, Dyar, Ashmead, Waite, Marlatt, Stiles, Caudell, Kotinsky, Chapin, Currie, Howard, and Benton, also present.

Under the head of Short Notes and Exhibition of Specimens, Mr. Chapin showed an abnormal specimen of *Pyrameis hunteri* which he had caught flying and which possessed a short abdomen and very much reduced right hind wing.

—Dr. Gill called attention to an extensive paper on the genitalia of Coleoptera in a recent number of Annales des Sciences Naturelles, and called especial attention to a typographical error in the numbering of the plates.

—Mr. Marlatt exhibited lemons from Southern California, showing the work of the rust mite on lemon. The lemons assume a silvery appearance, quite distinct from the effect of the mite's work on oranges in Florida. The work of the mite on lemon, just as in orange, does not seem to injuriously affect the quality or flavor of the juice, but silver lemons are thrown out in California and no buyer will purchase them.

—Mr. Benton announced a recent direct importation of Cyprian queen bees into this country for the first time in a number of years. He spoke of the breeding of Italian bees since 1860 to develop yellow color, which had resulted, by means of selective breeding, in increasing the number of yellow abdominal bands from 3 to 5.

—Mr. Kotinsky stated that he had found specimens of *Aspidiotus forbesi* on an old cherry tree at Mt. Pleasant, D. C. This is the first time it has been found in the District of Columbia.

Mr. Howard presented a list of nineteen species of Diptera, collected in Hawaii by Mr. H. W. Henshaw, and named by Mr. Coquillett. He stated that the distribution of these species was extremely interesting, both as bearing upon the fact that the order

Diptera, as a whole, has a very slight faunistic value, and as bearing further upon the modern extraordinary distribution of species by the agency of commerce. Among the nineteen species only four were new, and one other seemed to be peculiar to Hawaii. Ten of the species were practically cosmopolitan; one had previously been found in Australia; one had a general distribution in Oceanica, and one had been known previously only from Keeling Island, near Sumatra. The full list of these Diptera is as follows:

DIPTERA COLLECTED IN HAWAII BY H. W. HENSHAW.

By L. O. Howard.

Sargus n. sp.? Five specimens.

Psilopus sp. Two specimens.

Eristalis tenax Linn. Eight specimens. Almost cosmopolitan.

Syritta oceanica Macq. Four specimens. Described from Oceanica, New Zealand, and Tahiti.

Xanthogramma grandicornis Macq. Two specimens. Described from Australia.

Stomorhina pleuralis Thomson. Two specimens. Described from Keeling Island, near Sumatra.

Phormia regina Meigen. Four specimens. A European species also occurring over nearly the whole of the United States.

Lucilia cæsar Linn. Three specimens. Same distribution as the preceding species.

Calliphora vomitoria Linn. One specimen. Same distribution as the preceding, but much rarer.

Lucilia, 2 species, ten specimens.

Musca domestica Linn. One specimen. Cosmopolitan.

Stomoxys calcitrans Linn. Two specimens. Nearly cosmopolitan.

Hæmatobia serrata Desv. A European species which also occurs over the southern portion of the United States. Five specimens.

Homalomyia canicularis Linn. Two specimens. A nearly cosmopolitan species.

Ophyra leucostoma Wied. Four specimens. A European species, occurring over the greater portion of the United States.

Dacus cucurbitæ Coq. Five specimens. Described from Hawaii.

Drosophila n. sp.? Nine specimens.

Brachydeutera argentata Walk. Three specimens. Occurs over the southern portion of the United States, at least as far westward as Kansas; also in Cuba.

—Dr. Gill spoke of the fauna of Hawaii and said that the bird fauna indicated a relation to that of South America. The only original mammal (a bat) is related to North American forms. The shells, of which the family Actinellidæ form the bulk, are characteristic but are supposed to be more nearly related to the Pacific island forms west of the Hawaiian archipelago. The reptiles are all lizards and are all most nearly related to Asiatic forms. Mr. Ashmead considered the Hymenoptera of Hawaii to be related to the Indian fauna, and Dr. Dyar stated that the Lepidoptera, aside from the introduced species, appear to be most nearly related to Asiatic forms. Mr. Currie said that aside from one species from the United States and one from the United States and West Indies the Odonata were most nearly related to Asiatic forms.

—Dr. Stiles spoke briefly of a recent trip in the West to investigate parasites of domestic animals. He had studied *Œstrus ovis* particularly. He finds, contrary to the accepted views of entomologists and veterinarians that this species is a very dangerous enemy to sheep. In some large flocks at least 25 per cent. of the animals were affected, and after conducting a number of post mortems he was convinced that in many cases this species causes the death of the animal. The loss to farmers has undoubtedly been greatly underestimated by scientific men. He considers trephining for the maggots impractical, and has adopted a course of treatment which he thinks will prove important. He inserts an awl into the frontal sinus and through a trochar injects kerosene or gasoline. In case of gasoline poisoning he finds aromatic spirits of ammonia or sulphate of strychnia a good remedy, since gasoline is a heart depressant. He found the sheep tick, *Mallophagus ovinus*, to be very common in Colorado, where in one place at least it was introduced on bucks imported from Canada. So abundant was it occasionally upon young lambs that 100 or more would be found in a space the size of one's hand. Considerable loss results from the abundance of this so-called tick, but the insect is perfectly easy to treat by means of the ordinary sheep dips which need not be applied hot, but are effective when cold. He had been greatly impressed by the damage done by the screw-worm fly (*Lucilia macellaria*) to herds of cattle in the southwest. Their attack frequently follows the attacks of the

cattle tick, and on all large ranches men are employed especially to treat this insect continuously. He had seen a skin pocket on a steer which contained more than 100 larvæ. It is easy to treat such cases either with crescylic acid or some other wash, and they may be often washed out with water. In the case mentioned he washed the maggots out with water with the most perfect ease. What is needed, however, to prevent immediate reattack by the flies is some wash with collodion or something which will immediately dry up the sore surface so as to not attract the flies.

—Dr. Gill showed a book on natural history which he had studied when a boy 8 years of age, and which, while very crude and very inaccurate, had at that time possessed great interest to him. It was entitled, "A Natural History of the Most Remarkable Quadrupeds, Birds, Fishes, Serpents, Reptiles, and Insects," by Mary Trimmer, Boston, S. G. Simpkins, 1845. He called attention to many curious classificatory statements in the book, for example, showing that one tortoise was included among the quadrupeds, another among the reptiles, and a third among the fishes.

—Mr. Currie then read a paper entitled, "Some Rare Odonata from Washington and Vicinity." He exhibited and commented upon 9 different species which he considered rare, stating that 65 species in all have been found in the District of Columbia. In discussion, Dr. Gill stated that in his opinion the sub-orders of Odonata established by Dr. Calvert are misnamed "sub-orders" He would give them super-family rank, and considered that their separating characters were by no means of sufficient importance to entitle them to the term sub-orders. Groups of that value should approach much more nearly to ordinal rank.

November 1, 1900

The 155th regular meeting was held at the residence of Mr. Wm. H. Ashmead, 1825 Q st. N. W. President Gill occupied the chair, and Messrs. Chittenden, Heidemann, Chapin, Dyar, Busck, Morris, Waite, Johnson, Currie, Caudell, Ashmead, Howard, Pollard, Marlatt, Benton, De Schweinitz, and Hay, also present.

—Under the head of Short Notes and Exhibition of Specimens,

Dr. Dyar showed a method of mounting Lepidoptera separately in small glass boxes (glass above and below), of which 1,600 specimens were found in the Hoffman collection recently purchased by the U. S. National Museum.

—Mr. Heidemann exhibited specimens of *Gargaphia undulata* which he had found in the District of Columbia and at Bedford Springs, Pa., upon *Ceanothus americanus*, which he takes to be its native food plant. He also exhibited a specimen of *Aradus falleni* Stal., a species new to the District of Columbia, which had been taken by Mr. Jacob Kotinsky on the shirt sleeve of a friend whom he met in the streets of Washington. This species, originally described from Rio Janeiro, occurs in other South American localities, in Mexico, Key West, and Biscayne Bay, Fla., Virginia Beach, Va., and also in Arizona and New Mexico. It is the only species of Aradus found in Mexico.

—Mr. Johnson showed some tobacco which had been injured by *Lasioderma serricorne*, and described experiments in the extermination of this species in a large tobacco factory in Baltimore, where 160 boxes each containing 500 pounds of closely-packed tobacco received from Pennsylvania and Ohio were badly infested by this insect. The difficulty of reaching the insects in the interior of these 500-pound boxes either by steam, bisulphide of carbon, or hydrocyanic acid gas, was mentioned, and the fumigation of the entire factory with hydrocyanic acid gas with the consent and cooperation of the Baltimore police was described. This fumigation was eminently successful except for these tightly-packed boxes. The rats in the building were killed, as well as the beetles and their parasites (*Catolaccus anthonomi* Ashm.).

Some discussion ensued, participated in by Messrs. Waite, Marlatt, Chittenden, and Howard.

—Mr. Benton showed specimens of *Prionidus cristatus* which he said had been very abundant this year, over 100 being engaged in killing his bees on the grounds of the Department of Agriculture. He also showed a queen and three workers of the Cyprian bee.

—Mr. Ashmead stated that his experience in regard to the abundance of Prionidus the past summer had been the same as Mr. Benton's. Many specimens had been brought to him at the National Museum by people who said they had never seen it before.

—Mr. Currie showed a specimen of *Brachynemurus abdominalis* (Say) with imperfect development of the hind wings, which had been collected by Messrs. Collins and Maxon at Soldiers' Home, D. C.

—The first paper of the evening was by Mr. Howard, and was entitled "An Artificial Hastening of Development." In this paper he showed that after treating the surface of the water in a large glass vessel containing several hundreds of the full grown or nearly full grown larvæ of two species of Culex, many of them in from 15 minutes to 2 hours transformed to pupæ, and that from a number of these pupæ the adults issued within 15 hours, whereas under normal conditions the shortest duration of the pupa stage which he observed was 48 hours. He compared this apparent attempt at the perpetuation of the species in the presence of a unique emergency which threatened death to the well known phenomena in plants which blossom profusely after serious injury of one kind or another, and also to the inordinate desire for sexual intercourse on the part of human beings affected with certain fatal diseases.

The paper was discussed by Messrs. Waite, Gill, Johnson, Marlatt, Ashmead, and Hay.

—Mr. Waite said that certain species of fresh water algæ break up into zoospores when oxygen fails in the water supply; thus in mounting specimens for the microscope in water under glass slides this development is apt to take place almost immediately. He further stated that with flowering plants inordinately profuse blooming frequently indicates heretofore unsuspected root rot, and referred to the blooming of trees after girdling.

—Mr. Johnson stated that heavy over-bearing in fruit trees is sometimes followed by premature autumnal blossoming, which he thought indicated an injury to the tree from over-production.

—Mr. Marlatt said that in the citrus orchards of Southern California the orchards best cared for by irrigation and cultivation have splendid foliage but little fruit, whereas uncared for and abandoned orchards are often seen to be over-loaded with fruit.

Similar instances with other crops were mentioned by Mr. Waite.

—Mr. Ashmead said that the Diptera seemed peculiarly able to transform under unusual conditions. He said that with certain

s pecies of Phora in the south, when the food gives out even when larvæ are apparently not nearly full grown, they transform successfully, and the resultant adults are much smaller in size than normal individuals.

—Dr. Gill said that he had noticed similar extraordinary variations in size in the common house-fly, and stated further that Salamanders had been found to develop nore rapidly than usual in pools which were drying up. He also referred to the relation between reduction of heat and light, and retardation of development in the Amphibia and corresponding acceleration of development by the increase of heat and light, the same relation holding in Pisciculture and elsewhere. He also referred to abortion in the case of injury in the mammalia as bearing some relation to the observations described by Mr. Howard.

—Mr. Hay said that he had noticed that when food was lacking with crayfish or when they were thrown under normal conditions in large numbers in an aquarium profuse conjugation was immediate result.

—Mr. Benton said that when a queen bee was about to be replaced on account of exhausted vitality and failure to keep up the stock, and the production of a new queen is already begun, she will often "take a spurt" and in the last two weeks of her life will lay great quantities of eggs.

—Dr. Gill remarked that the sexual appetite is frequently increased by under-feeding rather than by over-feeding.

The final paper of the evening was by Mr. Dyar and was entitled:

ON THE SPECIFIC DIFFERENCES BETWEEN ALYPIA OCTOMACULATA FAB. AND A. LANGTONII COUP.

By Harrison G. Dyar.

I am not aware that the male of *Alypia langtonii* has been described. Since it is practically indistinguishable from *Alypia octomaculata*, captured specimens are naturally referred to that species, so that all specimens in collection under the label are females. In the last published account of the species (Neumoegen and Dyar, Journ. N. Y. Ent. Soc., II, 22, 1894), only the female is described. I have given a description of the larva (Can. Ent., 27, 278, 1895), and showed the differences between it and that of *Alypia octomaculata*, which are considerable, as is evi-

dent from the specimens which I exhibit before you. The habitats of the species are different. *Alypia octomaculata* occupies the Atlantic States from New York to Texas, and, living upon the grape and woodbine, is frequently common in our large cities. In fact, it is far commoner in such places than in the country districts. *Alypia langtonii* is found in northern New York, the mountains of New Hampshire, Canada to the Pacific Coast, and the mountains of California. It lives on the fireweed and is a wild species, found mostly in the woods remote from habitations. If the habitats of the two species overlap, it is not so to any marked extent. The female of *Alypia langtonii* differs obviously from that of *Alypia octomaculata* in lacking the basal spot of the hind wings completely or nearly so. In *octomaculata* the basal spot is constant, the outer spot occasionally disappearing. The males of the two species are alike in markings. It has been suggested to me that this was a good case to resort to the male genitalia, the expectation being that these organs would show marked differences. Such, however, is not the case, as the accompanying slides and drawings show.

The correlation of these species suggests the following questions:

1. Why should two species, obviously distinct, show no marked differences in the male genitalia when others are separable practically only by this character?

2. What are the causes determining the choice of food plants in two closely allied species, recently diverged from a common stock? In this case the woodbine and fireweed seem to be more nearly related in some way than their botanical affinities would indicate. It happens that two other closely allied species, *Eudryas grata* and *Eudryas unio* have selected these same plants as their respective foods.

In briefly discussing the paper Dr. Gill remarked that the similarity in the males and differences in the females noted in this species is entirely opposed to the rule which holds in birds where the females resemble each other and the males possess the sharpest differentiating characters.

—Dr. Dyar said that the instance was unusual in insects, the males as a rule being more distinct than the females.

DECEMBER 6, 1900.

The 156th regular and annual meeting of the Entomological Society of Washington, was held at the residence of Dr. L. O.

Howard, 1336 30th st. N. W. President Gill occupied the chair. Those present were Messrs. Schwarz, Gill, Stiles, Howard, Marlatt, Chittenden, Benton, Ashmead, Pergande, Cook, Johnson, Busck, Fox, Mann, Patten, Waite, Morris, Judd, Hay, Swingle, Chapin, Heidemann, Caudell, Kotinsky, Jones, and Currie; also the following visitors: Messrs. Gould, Jared Smith, Barber, Taylor, Ulke, and Simonds.

Mr. R. S. Clifton was elected an active member in the society.

The corresponding secretary read the following paper by Mr. Pergande:

THE ANT-DECAPITATING FLY.

By Theodore Pergande.

For many years past, when rambling about the woods surrounding the city of Washington, I frequently came across larger or smaller colonies of the so-called carpenter ant (*Camponotus pennsylvanicus* De Geer), the largest and most powerful of our indigenous ants, which, as a rule, prefers to select for its home, dead, or partially decayed, forest trees, stumps, and logs in which it excavates cavities of various sizes and shapes, for the purpose of having a congenial home and safe dormitories for its progeny. Frequently, on finding such a colony, I watched them excavating new chambers, the detached chips of which were either carried patiently to the base of the tree or stump, or simply dropped to the ground. In watching this work and seeing the chips dropped or deposited, I frequently noticed around the base of the tree, stump, etc., numbers of heads of this ant strewn about, which always aroused my curiosity as to the cause of this strange phenomenon. Thinking, however, that the ants to which these heads belonged had succumbed to disease or old age while in the colony, and that their earthly remains had been disposed of in this simple manner, I dropped the subject entirely. Recently, however, this subject of heads without bodies flashed suddenly on my mind, while in the woods near Cabin John Bridge, Md., on the 5th of September, 1900, after concluding some observations on certain insects inhabiting the witchhazels and birches at the edge of the small creek at the bottom of the little valley. I ascended the steep and wooded slope for the homeward trip; getting tired and out of breath when about two-thirds up the hill, I stopped to accumulate enough steam or lung power to enable me to gain the crest of the slope. While standing there to readjust my respiratory organism, I happened to be near a beech tree, which in this locality abounds. Casually looking over the smooth trunk I ob-

served a small worker of *Camponotus pennsylvanicus*, head downwards, about five feet above the ground, which had evidently come down from a foraging expedition, collecting the honey-dew or nectar of *Phyllaphis fagi*, which was very abundant on this tree. As a rule, these ants are very active in ascending and descending trees; this particular specimen, however, had stopped short for some mysterious reason and remained in this position while I was watching it and kept motionless until I touched it. The poor creature appeared to be tired and sleepy, and moved rather aimlessly and laboriously to one side on being touched. Being urged again, it moved a short distance in the opposite direction, seemingly in a trance or having lost the memory of its home. The action of this specimen appeared rather remarkable to me, since this species is very active, especially when disturbed, when it darts along at a rapid gait; it seemed to have lost control of its limbs and movements of its body. The head was drooping, as if of no use to its owner, though the antennæ were still moving. In fact, it seemed as if it had lost its head. In order to discover something of the cause of this ailment I transferred it to a large vial and took it home. After an hour or two of resting, after reaching my home, I examined the vial to learn how my little sufferer was getting along, but found to my surprise that the poor thing was minus a head, though still alive and quite as active as before on being urged to move about. Further investigations of the contents of the vial disclosed the head at the farther end of the vial, minus its antennæ and mouth parts, which were some distance in front of the head, and, while examining the skull of the ant through the glass, I observed the anterior part of a Dipterous larva protruding from the anterior opening of the shell, swaying back and forward, but soon to retire into the empty shell of the head. Next morning the poor victim was dead.

Having kept the specimen reasonably damp, I was rewarded and delighted to find on the morning of the 21st of September, or 17 days after the head had been cut off, a very handsome, extremely active and agile little fly in the vial, scurrying along with extremely rapid motions, only to stop now and then to clean itself and to exercise its horny genital apparatus in anticipation of the important work to be performed by it.

To continue my observations, and possibly to obtain additional infested ants, I went again to the same locality on the 24th of September, but failed utterly in discovering additional specimens showing symptoms of being infested. Being disappointed, and sitting down near the base of a beech tree badly infested with *Pemphigus imbricaria*, suspecting that there might be a colony of this ant at or near its base, I removed the loose bark, just above the ground, and found that I was not mistaken, for, as soon as it

was removed, there tumbled and scrambled forth numbers of this ant in utter consternation, which apparently had been hiding for some unexplained reason, instead of climbing the tree in quest of the abundant honey supply above. Some of these ants, in their headlong haste to escape imminent danger, were captured and placed in a vial in the hope of breeding one or more of the flies, though without success. All others succeeded in hiding themselves under fragments of sticks and dry leaves, which had accumulated around the base of the tree. On removing this accumulated waste gradually, I found that the ants had their formicary under and between the larger roots of the tree, and on being again disturbed they scampered in evident alarm for their underground passages. While this was going on most of the exit holes had been closed with earth, preventing the stragglers from entering their home in time. While watching the frantic efforts to conceal themselves, I observed minute objects flitting rapidly about and hovering above and near the spot where the majority of the ants had disappeared, alighting now and then in quest of some particular object. The light in this particular locality is rather dim and subdued, with a streak of sunlight here and there, which renders it very difficult, especially at the surface of the ground, to distinguish with any certainty the minute insects whirling about near the entrance of the formicary. Being suspicious, however, that some of those animated dots, darting back and forth, might be the enemy of these ants, I managed to capture four of them, and found on examination that they really belonged to the species infesting the head of this ant, though all of them were females. While thus engaged I observed one of the ants which had secreted itself under one of the roots, make its appearance for the obvious purpose of reaching the entrance to the nest, and observed that no sooner had it made its appearance than one of those winged atoms made a dart for it, which frightened the poor creature to such a degree that it almost tumbled over itself when it scrambled in great haste to hide itself. This observation seems to indicate that the ants are in mortal terror of their diminutive foe and deadly enemy.

FIG. 20.—*Apocephalus pergandei*. Adult—greatly enlarged.

Another trip was again made to the same locality on the 27th of September. But very few of the ants were observed, while the flies were still more scarce. Only one female was captured, which was still alive and very active the next morning. On placing one of the ants in the tube containing the fly, I soon observed that the ant had become aware of the presence of its enemy and commenced to run restlessly back and forth, the fly watching it rather interestedly; coming accidentally in contact with the fly, the latter darted at the ant, which, enraged at this unsuspected attack, went for it with a furious rush and widely open mandibles. For a moment there was a general mix-up, reminding one strongly of two tom-cats in a fight, during which combat the ant was trying hard to catch the fly with its legs and mandibles, though on account of its extreme agility it rushed between the legs of the ant and escaped unharmed. This battle was kept up for some time, the fly jumping on the back and head of the angry ant till both became tired out, especially the ant, which walked about slowly, cleaning her head, mouth, antennæ and legs; the poor creature became at last so completely exhausted that her legs commenced to tremble. The fight between the two had evidently lasted through some part of the night, when the ant at last succeeded in capturing the fly, which it crushed to a shapeless mass. On examining the ant the next morning, I failed to find any eggs on any part of its body.

After rearing this fly I wrote to the distinguished European writer on Formicidæ, Professor Charles Emery, and asked him whether he knew of any observations upon the decapitation of ants. He replied that nothing of this nature had been called to his attention, except the fact that *Formica exsecta*, a very savage fighter, in the course of its battles frequently cuts off the heads of its opponents.

Later, mentioning the matter to Dr. L. O. Howard, he called my attention to the observations reported by Dr. W. H. Fox, at the September, 1887, meeting of this society, published in Volume I, pp. 100 and 101. Dr. Fox found the decapitated heads of *Camponotus pennsylvanicus* at Hollis, New Hampshire, in the summer of 1887, and discovered that they contained Dipterous larvæ. At a meeting of the Biological Society of Washington, held in October, 1887, Dr. Howard mentioned this observation of Dr. Fox's and suggested that the Dipterous larvæ in question might belong to the family Conopidæ, the larvæ of certain species of which in Europe are parasitic upon Hymenopterous insects. The present observations set the matter at rest and indicate the true nature of the parasite. It is probably identical with or at least congeneric with the species observed by Dr. Fox in New Hampshire. The adult parasites were referred to Mr. Coquillett, who finds that they constitute a new genus of the family Phoridæ.

His descriptions of the new genus and the new species are appended.

Apocephalus, Coquillett, nov. gen.

Near *Phora*, but the female furnished with a horny ovipositor about as long as the last three abdominal segments taken together. Frontal setæ reclimate, two pairs of vertical and orbital bristles, a pair of postvertical and ocellar bristles, the latter situated lower than the lowest ocellus, also a pair of bristles above the base of the antennæ; third joint of antennæ oval, the arista rather robust, pubescent; thorax in profile strongly convex; tibiæ destitute of long bristles on the outer side; second heavy vein of the wings forked, four slender veins of which the first two and last one are arcuate, the third gently curved S-shaped. Male unknown. Type, the following species:

Apocephalus pergandei, Coquillett, n. sp.

Head black, opaque, gray pruinose, the mouth parts and antennæ, except the arista, yellow; thorax yellow, the mesonotum polished; a pair of short acrostichal bristles, a larger dorso-central pair, two large and a median small pair of supra-alar bristles, one humeral and two posthumeral bristles, also two on the pteropleura; scutellum yellow, bearing four bristles, middle of metanotum brown; abdomen yellow, opaque, a pair of spots on the second segment and sometimes on the two following, alteral vitta and the last segment black; abdomen bare except along the sides where each segment except the first bears a few black bristles; ovipositor black, polished, flattened, lobed near the base where it is slightly wider than the last abdominal segment, the remainder of nearly an equal width, the apex truncated; a rounded median carina and a pair of oblong cavities near the base; legs yellowish white, the tarsi brownish yellow, middle tibiæ each bearing a strong spur at apex of the inner side; wings hyaline, veins brown, costal fringe scarcely longer than the diameter of the costal vein; halteres yellow, apices of the knobs blackish; length, including the ovipositor, 1.5 mm. Five female specimens, one of them bred from a head of *Camponotus pennsylvanicus*, by Mr. Th. Pergande, to whom I take pleasure in dedicating this interesting species. Type No. 5201, U. S. National Museum.

Fig. 21.—*Apocephalus pergandei.* Head from front — greatly enlarged.

No species of *Phora* known to me possesses the three characters of reclimate frontal bristles, a branched second heavy vein and bristleless tibiæ; this fact, and the possession of a long, horny ovipositor, added to the unique habits, would appear to warrant the erection of a separate genus for the reception of the present species.—D. W. Coquillett.

Dr. Howard called for a few remarks from Dr. Fox, who, as mentioned in the paper just read, made the interesting discovery that the decapitated heads of these ants were infested by Dipterous larvæ. Dr. Fox, in responding, congratulated Mr. Pergande for having worked out the life history of this parasite. Mr. Ashmead said he considered Mr. Coquillett fully justified in erecting a new genus for this fly, whose peculiar structure was undoubtedly correlated with its mode of life, so different from that of other members of the family Phoridæ. Specimens of this fly were then passed around for the inspection of the members.

The paper by Mr. Schwarz, then presented, was entitled:

A SEASON'S EXPERIENCE WITH FIGS AND FIG-INSECTS IN CALIFORNIA.

By E. A. Schwarz.

The successful introduction of the Fig-insect (*Blastophaga grossorum*) into California by Dr. L. O. Howard and Mr. W. T. Swingle, of the U. S. Department of Agriculture, in the spring of 1899, was followed in the year 1900 by a season of practical experience and experiment at Fresno, Cal., which resulted in the production of the first large crop of real Smyrna figs (*i. e.*, figs with fertile seeds) ever produced in America, the figs being of a quality equal, or even superior to the figs imported from Asia Minor. It was then demonstrated beyond any possible doubt that the intervention of the Blastophaga is absolutely necessary to a production of a large crop of Smyrna figs (a few hundreds or even thousands of figs can be successfully matured by the laborious process of pollinating the figs by means of a blow-pipe). That there was a chance of demonstrating this fact on a large scale in America is solely due to the courage and foresight of Mr. Geo. C. Rœding, of Fresno, Cal., who, alone of all the Californian orchardists, kept up, at great expense, for more than ten years, an extensive orchard (about 62 acres) of Smyrna fig trees without deriving the slightest profit from it.

The Smyrna Fig Trees.

The annual cycle of the life history of the Blastophaga proves to be a very simple one, but appears to be greatly complicated to any one who has no knowlege of the natural history of the Smyrna fig tree. The latter subject deserves to be more thoroughly studied than has hitherto been done, and offers to a competent student a wide field for important and novel observations.

It is now generally conceded that the female fig tree bears only two crops of figs each year. Regarding the male tree (Caprifig tree), even the most recent botanists maintain that there are three crops, although it is usually stated that there is no sharp distinction between the figs of the second and third crops. In the three varieties of Asiatic caprifig trees represented in Mr. Rœding's orchard * it was found to be impossible to distinguish more than two crops both as to mode of growth as well as construction of the figs—a spring crop (profichi figs), and a fall crop (mammoni figs); the so-called third crop (mamme figs), consisting merely of late individuals of the second crop which remain on the trees during the winter *solely because they are inhabited by the Blastophaga.*

The Crops of the Caprifig Tree.

The spring crop of the Caprifig, which develops on the previous year's growth, is extremely vigorous both in the size and number of figs; it is characteristic of a male tree. *i. e.*, the figs contain, besides gall flowers (in which the Blastophaga undergoes its transformations), a large number of male flowers, which produce an abundance of pollen. Abnormal figs appear to be very rare in this crop. Occasionally one is found in which the male flowers are entirely missing (in Rœding's Capri No. 2); and one variety of Capri trees (Capri No. 1) produced a small number of figs which most probably contain a large number of female flowers.†

The fall crop of the Caprifig develops on the new growth; it is extremely weak and inconspicuous in comparison with the spring crop. The figs are small and appear, with few exceptions, several weeks later than the corresponding crop of the female tree; they develop gradually so that at no time are there many figs on each tree; but buds continue to develop to figs as long as warm weather lasts (to middle of November or even later). Gall flowers are normally present but in much smaller number (mainly on account of the smaller size of the figs), than in the spring crop; male and female flowers are commonly met with, but their frequency and combination with gall flowers varies greatly accord-

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* These were imported by Mr. Rœding directly from the Aidin fig district above Smyrna in Asia Minor. Their native names are unknown, and Mr. Rœding has designated them as "Capri No. 1," "Capri No. 2," and "Capri No. 3."

† The nature of these interesting figs was unfortunately misinterpreted by the writer at the time they were found (in May). They are referred to in his reports to Dr. L. O. Howard as profichi figs affected by "the ostiolum disease."

ing to the individuality of the trees and according to the varieties of Caprifig trees.* The presence of female flowers in the Caprifigs interferes more or less with, or eventually entirely prevents the development of the Blastophaga.

Caprifig trees from which a large number of cuttings have been taken, or from which the "inside growth" has been trimmed out, are generally avoided by the Blastophaga. The same holds true of over-pruned or over-trimmed female trees.

The Crops of the Female Fig Tree.

In the female tree, it is the fall crop (*i. e.*, that developing on the new growth) which, in vigor corresponds with the spring crop of the male tree; the crop is characteristic of a female tree in producing only genuine female flowers, which when pollinated by the intervention of the Blastophaga, secrete a large amount of saccharine matter and produce fertile seeds. Without pollination by the insect the figs drop off before they attain the size of a large cherry.

The spring crop of the female tree, *i. e.*, that developing on the previous year's growth, corresponds with the fall crop of the male tree; the flowers of the figs are, according to the botanical authorities, malformed female flowers, incapable of being fertilized even if pollen were obtainable at this season.†

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*Rœding's Capri No. 2 produced, with few exceptions, only normal figs, *i. e.*, figs containing exclusively gall flowers. Capri No. 3 produced, besides normal figs a large number of figs containing male flowers, but the latter are never numerous, appear to be somewhat deformed, and produce only a small amount of pollen. Figs are also frequently met with which besides gall flowers and male flowers contain a smaller or larger number of female flowers. Strictly bi-sexed figs, *i. e.*, containing only male and female flowers, are very rare. Rœding's Capri No. 1 is remarkable in producing, besides normal figs, a large number of figs containing a smaller number of female flowers. Male flowers are here exceedingly rare, but figs containing exclusively female flowers are not uncommon.

†This crop is, of course, without practical importance, and the writer has neglected to study the flowers of this crop in the Asiatic varieties of Smyrna fig trees as represented in Mr. Rœding's orchard It suffices to tell here that at least one variety (Rœding's "Commercial Smyrna") produced in June an abundance of large, edible, and sweet figs (of course without fertile seeds) comparable in quality to the best Adriatic figs. These figs could not possibly mature if the flowers were genuine female flowers. On at least one tree of the same variety the writer found in April buds of male flowers.

THE BLASTOPHAGA AT FRESNO, CAL., IN 1900.

The winged female Blastophagas* commenced to emerge from the winter figs on March 28, and continued to do so until the end of April. The females at once enter the young figs of the spring crop of the Caprifig trees. Under normal conditions the "outdoor" life of each individual female Blastophaga does not last longer than 5 or 6 minutes; it takes from 3 to 4 days, or from 5 to 8 days, according to the season, for the Blastophaga females inhabiting an individual fig to issue from the same; it takes about 5 weeks for one entire generation of Blastophaga to issue from the figs in which they have developed; the life duration of an individual Blastophaga averages (excepting of course in the hibernating generation) 64 days.

The first, or spring generation of Blastophaga issued from the spring crop (Profichi) of male figs between June 11 and July 5. It is well known that the female Blastophagas of this generation, when issuing from the profichi figs are covered with pollen, and that they can be used for caprification, *i. e.*, for pollinating the blossoms of the female figs by transferring the male figs onto the branches of the female tree.†

The Blastophagas thus used are of course lost for the propagation of the species, but those left on the male trees enter and oviposit in the succeeding generation of male figs which constitute the first set of the second crop (fall crop) of the Caprifig tree. This set of figs is, however, very slow to make its appearance so that there is only here and there a young fig to be seen on the Caprifig trees at the time when the bulk of the Blastophaga females emerge from the spring figs. This break in the succession of the crops of the Caprifig has been noted by all writers on the subject, but no explanation of this singular phenomenon has ever been offered. In his reports to Dr. L O. Howard the writer has attempted to give an explanation which, in due time, will be published by the Department of Agriculture. As a consequence of this break, an enormous reduction in the number of specimens of the insect takes place normally in the second generation. At Fresno, in 1900, the number of Blastophaga females which issued from the spring figs was roughly estimated to be more than three millions of specimens (the inhabitants of about 20,000 figs); whereas, in spite of the utmost care in transferring

*The reader should bear in mind that the Blastophaga never lives in the female figs, and that it solely develops within the so-called "gall flowers" of the male tree.

† An account of this operation as practiced for the first time in America is published by Dr. L. O. Howard, in the Yearbook of the U. S. Department of Agriculture, for the year 1900.

figs, this number was reduced in the second generation to the inhabitants of not more than 150 or 200 figs, each of these small figs harboring, in the average, not more than about 75 specimens of Blastophaga.

The imagoes of this weak generation issued between August 12 and September 13, and since at that time a tolerably large number of young figs are available for oviposition, the succeeding or third generation of Blastophaga becomes again quite numerous in specimens.

Once more the Blastophagas were seen on the wing, and the larger portion of the imagoes of the third generation issued from October 5 to November 10, when the observations were discontinued, the females ovipositing in and forming a fourth generation in the latest Caprifigs of the season. At this time, however, the Caprifig trees develop only a very limited number of young figs, and many thousands of Blastophagas fail to find figs for oviposition.

The cold weather of the approaching winter arrests any further development of both Caprifigs and insects, and the Blastophaga, partly belonging to the third generation and partly to the fourth generation, hibernates in any of its stages.

The Blastophaga at Niles, Cal.

Nothing can illustrate more forcibly the great diversity of climatic conditions prevailing in California, than the experience obtained with the Blastophaga during the year 1900. Early in April of this year, some winter figs containing the Blastophaga were sent from Fresno to the well-known horticulturist, Mr. John Rock, who has a number of Italian Caprifig trees in his magnificent arboretum of fig trees at Niles, Cal., only 170 miles north of Fresno. This attempt of establishing a second colony of Blastophaga in California was eminently successful, but instead of the four generations annually observed at Fresno, the insect underwent only two generations at Niles. The imagoes of the first generation did not issue before the end of July, the latest date of issue being September 2.* The ensuing second generation, observed only on a single tree,† did not mature to imagoes in the fall and will no doubt successfully overwinter.

A couple of Caprifigs containing insects of the first generation, were re-imported from Niles into the hot summer climate of

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*This date has been kindly furnished by Mr. G. P. Rixford, of the California Academy of Sciences.

†This magnificent tree originally purchased by Mr. John Rock from Dalmatia as an Adriatic fig tree, has been baptised by Mr. Rock, Dr. G. Eisen, and the writer as the "Endrich Capri tree."

Fresno on July 17, and the winged Blastophagas issued from these two figs between July 21 and July 27. Their progeny formed a second generation of which the winged females issued from the figs between September 17 and September 28. The third resulting generation did not complete its transformations the same season, but had increased to the inhabitants of at least two thousand figs and thus counteracted, in no small measure, the loss caused by the issuing of the fourth generation of the Fresno Blastophagas.

Mr. Swingle stated that one reason for the incomplete and often erroneous conclusions in reference to figs reached by the botanists was that they had depended very largely upon certain entomologists for their data. He made some remarks regarding his work with figs in Italy and North Africa. In reply to the question whether there were any parasites introduced with the Blastophaga into California, Mr. Schwarz replied that, to his knowledge, none had been introduced, but that large numbers of the fig-insects were destroyed by being caught in the webs of spiders spun commonly on the fig trees. He said it was very important that other varieties of Caprifig trees be brought in. Mr. Swingle mentioned a Nematode, Anguillula, which, probably living as a mess-mate, was somewhat injurious to the Blastophaga in the Old World. Dr. Stiles was inclined to consider this Nematode not as harmless as supposed, and he mentioned some allied forms of this and other genera which have been found to be quite harmful.

—The following paper was sent by Prof. Uhler for publication in the PROCEEDINGS:

SOME NEW GENERA AND SPECIES OF NORTH AMERICAN HEMIPTERA.

By P. R. UHLER, LL. D.

Div. MYODOCHINA.

Dycoderus, new genus.

Closely related to *Ptochiomera* Say. Head thick sub-conical, hairy and including the eyes, about as wide as the anterior lobe of the pronotum; antennæ very thick, the apical joint thicker than the others, about twice as long as the third, the second longest, thinnest, tapering towards the base, the basal joint stout, shorter than the front, subfusiform; eyes globular, placed below the line of the convex front, the front broad, tu-

midly convex in union with the vertex, cheeks short, tylus long and narrow, the rostrum slender, geniculate, reaching upon the middle coxæ, the basal joint longest, moderately thick, second almost as long, reaching upon the anterior coxæ, the third much shorter; gula swollen, the bucculæ slender, long. Pronotum sub-campanulate, deeply constricted at about two-thirds of the length posteriorly, the groove carried down continuously to the sternum, anterior lobe about twice as long as the posterior one, sub-quadrangular, a little convex, having the lateral border curved, bent down, and the edge very narrowly reflexed, posterior lobe broad, very short, with the lateral margins oblique, elevated on the posterior border, and sloping down to the sulcated line; posterior middle of the prosternum deeply excavated, and bounded behind by a callous ridge. Anterior femora stout, sub-fusiform, hardly longer than the tibiæ. Scutellum tumid next the tip. Abdomen expanding posteriorly in a curve, wider than the pronotum. Corium narrow, triangular at base, curving wider behind the middle, the membrane barely extending beyond the tergum, the apical curve oval, veins indistinct, not apparently continuous, underside of body highly polished.

D. picturatus, new sp.

Oblong subovate, piceous-black, more or less rufous beneath, covered above with grey, erect bristles, and coarsely punctate; head thick and nutant, impressed across the middle and at base, coarsely punctate in a lunate depression; antennæ rufo-testaceous, the apical joint and outer end of the third black; rostrum rufo-testaceous, darker at base and tip. Pronotum polished, the anterior margin arcuated and with one or more transverse lines of punctures behind it, the humeral angles callous, a little elevated, bounded behind by a short, grooved line. Scutellum black, deeply punctate. Hemelytra flat, dull black, finely punctate in the sutures, base with a triangular whitish spot and apex with a narrow, transverse spot of the same color, costal margin acutely reflexed; membrane convex, dusky posteriorly and with a pale border. Legs pale rufo piceous, the tibiæ testaceous, piceous at tip, tarsi mostly piceous.

The female is a little wider than the male. Length to tip of abdomen ♂ $2\frac{1}{2}$, ♀ 3 mm, width of pronotum $1\frac{1}{8}$ mm.

A pair ♂ ♀, collected near Phoenix, Arizona, belong to Mr. E. D. Ball, and another from near Denver, Colorado, is in my own collection.

Div. Saicida.

Orthometrops, new genus.

Long fusiform, somewhat like a narrow *Coriscus*. Head long before the eyes, subcylindric, a little nutant, decurved at tip, neck sub-annular, swollen, smooth, a little longer than the eyes, constricted behind them and at base; eyes oval-orbicular, projecting laterally; antennæ setaceous, about as long as the entire body, the basal joint nearly as long as the

head and forward lobe of the pronotum united, a little thicker than the others, third and following joints very slender, the second longest; rostrum slender, not abruptly narrowed, bent towards the prosternum, the basal joint longest. one-third longer than the second. Pronotum longer than the head. with the anterior lobe narrow, and obconical anteriorly, bounded behind by a deep stricture. the posterior lobe much wider and shorter, subtrapezoidal. high, widened posteriorly, bluntly carinate on the lateral margins and terminating in a callosity on the humeri. Scutellum triangular. acuminate at tip. Hemelytra long, oblong-ovate behind, the membrane slender on the inner border of the corium and widening towards the apical curve, the veins stout. forming a large, oblong basal cell. and running backwards and curving towards the apex. Connexivum left uncovered by the hemelytra. Venter carinate on the middle line. Legs long, the anterior femora long and thickened, the tarsi short and very slender. Throat and second joint of rostrum armed with stiff bristles.

O. decorata, new sp.

Yellowish or greenish testaceous, polished, mostly smooth; the head more or less rufous. antennæ yellow, usually dusky beyond the second joint, eyes brownish; rostrum piceous at tip. Pronotum linearly rufous on the middle of anterior lobe. posterior lobe unarmed. Scutellum more or less rufous or brownish, slenderly carinated on the lateral margins, acutely acuminate at tip. Corium thin, clouded with fuliginous beyond apex of clavus and bordered with red at tip. the clavus red next the scutellum; membrane pale brown, darker on the basal middle. Apical portion of tergum more or less dusky. Legs testaceous, with the apex of tarsi and the nails piceous.

Length to end of abdomen 5 mm. Width of base of pronotum $\frac{3}{4}$ mm.

Several specimens were collected near Bladensburg, Md., by Mr. O. Heidemann, and one from Pennsylvania, some were sent to me by Mr. Carl F. Baker. It has also been found near Madison, N. J., by Mr. F. C. Paulmier.

Fam. Cixiidæ.

Monorachis, new genus.

Form of a long *Issus*, but related to *Plectoderes*. Vertex short, tubular, transverse, lunately emarginate behind, sinuated to receive the eyes, the apex slightly angularly produced, *front* broad oval, emarginated to receive the clypeus, with the lateral angles acutely carried down to border the clypeus, the lateral margins prominently raised and the adjoining surface correspondingly depressed, the middle strongly carinate, *clypeus* triangular, longer than wide, narrower than the front, convexly elevated longitudinally, the outer margins carinately reflexed, *rostrum* reaching over the middle coxæ, base of antennæ globose, almost as large as the eyes. *Pronotum* very narrow, entering deeply into the notch of the

head, *mesonotum* with the middle shield triangular, about twice as long as wide, carinate on the middle and sides, bluntly triangular at the posterior end, the pleural area carinate. Legs short, stout, the anterior femora grooved and carinate beneath, tibiæ flattened on the outer surface and margined with carinate lines. *Hemelytra* scarcely longer than the abdomen, bluntly rounded at tip, the veins coarse, granulated, the medial areoles few, long, narrow, the apical series composed of rather short areoles which widen apically, clavus large, long, acutely subtriangular. Abdomen short and stout.

M. sordulentus, new sp.

Dark brown, somewhat clouded with obscure fulvous. Vertex dull yellowish, indented each side of middle, brown on the posterior suture, front soiled yellowish, a little obscured with brown on the lateral margins, clypeus same color, but soiled brownish each side of tylus, rostrum and eyes brown. Dorsal shield of mesonotum pale brownish, with the carinate lines coarse and pale yellow. Pectoral pieces pale brown, more or less spread with yellowish. Coxæ soiled yellowish, the legs brown, tibiæ, apex of femora and portions of the tarsi, pale fulvous. Hemelytra dull fulvous, crossed by irregular bands of brown ragged spots, the coarse vein of inner margin and veins between the spots pale fulvous or testaceous. Abdomen brown, paler beneath, the connexivum interrupted with pale fulvous spots.

Length to end of abdomen $3\frac{1}{4}$ mm. Width across base of hemelytra $1\frac{1}{2}$ mm.

One specimen, a female, was collected near Lake Worth, Fla., by Mrs Annie Trumbull Slosson. I have also examined fragments of a specimen of the same species from the Indian river region.

Cyphoceratops, new genus.

Remarkable for having the lamellæ of the vertex carried up divaricating and curving back, expanded like ears to the posterior line of the eyes; front very long, gradually narrowing above, widening below and forming a long oval figure with the clypeus, the middle line defined by a continuous thick carina, lateral margins slenderly carinate, and continued on the clypeus; eyes large and prominent, longer than the height of the auriculate lamellæ; basal joint of antennæ subfusiform, shorter than the second, which is stout and knob-like; rostrum short, thick, and wide, not extending behind the anterior coxæ. Pronotum very short, a little triangular on the middle and bluntly carinate; mesonotum triangular, a little wider than long; scutellum small, longer than wide. Hemelytra long, suboval, about three times as long as wide, the base a little curved and the apex of membrane obliquely curved, basal series of areoles long, narrow, simple, the vein next outside the inner areole forked at tip, the costal areole longer than the next of the series, and these terminating on the same

transverse line, six ante-apical areoles, the three middle ones being much longer than the others. the central one long wedge-shaped and with a triangular tip; apical series composed of twelve narrow cells, and a small one next the costal tip. Eight apical areoles to the wings, the third one of which, from the outer margin, is curved-triangular. Posterior tibiæ long, prismatic, carinate-edged, armed with three small teeth and with a stout, long spur at tip. The pleural breast pieces beneath the pronotum are as long as from pronotum to suture of base of clypeus, are wider diagonally and angular at base and become rounded (*i. e.*, suboval) at tip, and are bright green with an orange stripe throughout the length of the middle line. There are four long areoles (including the costal), to the base and middle of corium, and with a triangular cell inserted at tip between the third and inner areoles.

C. furcatus, new sp.

Moderately robust, greenish testaceous, the face and ante-pectus bright green, striped with orange, tip of rostrum black; pro- and mesonotum pale green, dusky each side, and with dark marks exteriorly. Pleural segments either with a black dot or irregular mark. Hemelytra hyaline, tinged with green, the veins dark brown. Tergum greenish white at base, with a blackish cloud on the middle; venter pale green, the segments marked with black bands. Legs green, with the spines and tips of tarsi piceous.

Length to end of abdomen, $3\frac{1}{4}$ mm. To tip of hemelytra, 6 mm. Width across base of hemelytra, $2\frac{3}{4}$ mm.

Found in Cuba; one specimen from E. D. Ball, Port au Prince.

Cotyleceps Uhler.

C. procellata, new sp.

Pale brownish gray, moderately robust, wing-covers straight on the upper margin and curving moderately on the costal border, widening a little posteriorly, and the membrane slightly valvate, wider, bluntly curved. Vertex short, subquadrangular, wider than long, with the marginal carinæ less elevated than normal, the color pale orange and continuous with the same color, forming a broad vitta on the middle line of the entire notum, the carinate lines white, front paler, deeply sunken throughout each side of the prominent middle carina, carinate folioles of the margins prominent and strongly curved; rostrum slender, piceous at tip. Pronotum very short, sublunate, narrowing to a mere border behind the eyes. Mesonotum dark brown on the lower sides, the dorsal shield about twice as long as wide, triangularly rounded at base, acutely triangular and pale yellow at tip, the middle line and lateral margins carinate pale yellow, straight. Hemelytra almost opaque. a little dusky, minutely granulated, the inner border broadly and the apical margin narrowly pale, costal margin with three or four short brown transverse spots. the veins brown and crossed behind the middle by three wavy oblique bands of

brown spots, and near the apex with clusters of brown spots arranged in curves, more dense at the upper outer angle, before the middle more faintly marked with brown streaks and dots. Two of the middle apical areoles long triangular, most of the others subquadrangular. Abdomen wide. Femora and tibiæ dull testaceous, clouded with brown, the tarsi banded with brown, the nails piceous. ♀.

Length to tip of abdomen 4 mm. To apex of closed wing-covers $5\frac{1}{2}$ mm. Width of mesonotum $1\frac{1}{2}$ mm.

One female from Hayti, and another is in the collection of Mr. E. D. Ball, obtained near Port au Prince in February.

Div. Dictyophorida.

Tangyria, new genus.

Head semicircular, blunt edged above, the vertex depressed in the middle and marked there with a triangular carinate line, front about one and a half times as long as wide, obliquely widening towards the clypeus, the middle line bluntly carinated and the carina interrupted at the clypeus, the clypeus subequilaterally triangular, not carinate. Pronotum acutely lunate, set deeply into the head, notched at base, having a blunt carina which is continued back to the scutellum, shield of the mesonotum longer than wide, triangularly rounded in front, the lateral, bounding carinæ curving and divaricating posteriorly. Pleural piece behind the eye longer than wide, bounded by straight carinæ, sulcate, produced in a point behind. Hemelytra supplied with numerous straight veins, the costal area narrow, caused by numerous oblique veins, membrane with about thirteen series of eight elongated cells, bounded by black cross-veins. Posterior tibiæ carinate on the edges, provided with two spines near the middle.

T. frontalis, new sp.

Bright pea green, polished, moderately robust, vertex a little wider than long, the border next the front marked with six black spots, those next the eyes being linear, all placed on a yellow band. Carinate lines of head and notum whitish. Hemelytra moderately long, nearly parallel-sided, the costal margin very slightly curved, membrane about one-third the length of the corium, almost straight across the base, the outer angle acutely produced, cross-veins black, slender, inner angle of apex very slightly rounded. Spines of tibiæ and tarsi, and the nails black.

Length to end of abdomen 5 mm. To tip of hemelytra 8 mm. Width of mesonotum $2\frac{1}{4}$ mm.

One specimen (♀) from Port au Prince, Hayti, December, is in the collection of Mr. Elmer D. Ball.

Tangiopsis, new genus.

♂ Form similar to *Tangia*; the vertex short, almost flat, a little wider than long, curved on the anterior margin, the entire margin carinately raised, and the middle line bluntly carinated; front about one-half longer

than wide, almost truncated at the summit, the sides curving wider towards the clypeus which completes the curve and tapers to the tip, the margins slenderly elevated and the middle line with a blunt carina, which continues on to the rostrum, the clypeus less than one-half the length of the front, cheeks narrow and long. Pronotum short, almost crescent-shaped, with the central shield triangular, bounded by raised lines and let into the base of the head; mesonotum about twice as long as the preceding, with the dorsal shield bluntly triangular, bounded by raised lines, and having a middle carina. Propleura wide, almost triangular, with a large hole near the middle, segments behind this each with a black, depressed spot Scutellum very small. Hemelytra not long, bluntly curved, almost transparent, all the nervures set with raised granules, and the intervals with rows of raised points. Costal areole wide, but a little shorter than the others of this series, the three innermost about equal in length, the interpolated one long cuneiform, the ante-apical series short, six in number, the one on either side very short, apical series moderately short, narrow, the exterior ones on both borders curved, twelve in number. Posterior femora with two spines behind the middle. Ocellus on middle of front.

T. tetrastichus, new sp.

Pale green, the face deep green with the middle carina orange, the lateral margins of entire head more or less yellow, occiput with two black spots, diagonal lines of the mesonotal shield orange. Veins of hemelytra stout, sometimes a little dusky, spaces between the veins granulate in lines, transverse veins of membrane and wings and a subapical series of spots dark brown. Spines and nails of feet piceous Pleural pieces with a black dot in middle of first three. Length to apex of abdomen 3 mm. Length to tip of wing covers $4\frac{1}{2}$ mm. Width of hemelytra 2 mm.

A male and female from Port au Prince, Hayti, are in the collection of Mr. E. D. Ball. December.

Div. Flatida.

Dascalia, Stal.

D. guttata, new sp.

Pale greenish testaceous, pruinose, marked with four black spots on the posterior curve of the pronotum, with an oblique series of three, and one exterior, before the middle of the corium, with a sprinkled series near the inner border, with numerous points of the same color remotely distributed between the middle and costal area, and with a geminate series of specks on the costal margin which is continued near the outer margin of the apex of membrane, a zigzag curved band of the same color also a little further inwards. Vertex short, subtriangular, uneven, with two transverse series of black points; front almost flat, not much longer than wide,

with the summit prominent, truncated and rectangular below, the lateral margins barely sinuated, clypeus longer, acutely triangular. Pronotum forming a subcrescentic collar entering the head and curving around the front of the mesonotum, two indented black points on the middle, and others exterior to these; mesonotum sub-semicircular, broad triangular apically, raised above the level of the head, feebly convex, stained on the forward border, with a large black spot at each outer angle and with two dots on the middle and two at base; middle of scutellar portion also with a black dot. Hemelytra ample, obliquely decumbent, marked as above recorded, the costal field wide, rounded and expanded near the base, the diagonal veins numerous, longitudinal veins of the membrane sometimes dusky. Beneath and legs pale testaceous, or white with a tinge of green. Length to tip of wing covers 9 mm. To end of abdomen 6½ mm. Width of pronotum 3 mm.

One specimen from Port au Prince, Hayti, December, in the collection of Mr. E. D. Ball; another from Cuba in my own collection.

D. acuta, new sp.

Pale dull testaceous with a tinge of gray or olive, robust, with ample hemelytra. Head bluntly triangular, hardly longer than the pronotum, with the lateral margins of the vertex oblique, a little curved and followed inwards by a deep, long depression; front polished, longer than wide, curving a little narrower below, the margins strongly reflexed and bounded inwards by a groove, the summit made prominent by a rounded dark callosity, clypeus longer than wide, acutely narrowing, obsoletely carinated on the middle. Pronotum crescentic, strongly arcuated, the narrowing sides curved back beyond the limit of the eye, indented each side of the middle; mesonotum prominently raised, the dorsal shield oval, nearly twice as long as wide, carinated on the margins and middle line, the sides exterior to the shield convexly declining. Hemelytra wide, steeply declining, bluntly rounded, the costal area broad, with the humeral end prominent, and with two series of black dots, the cross-veins coarse, brownish, distinct, mostly simple, somewhat reticulate at base on the basal portion; disk with two approximate, brown, dagger-shaped marks, the surface with remote, small, black dots. Cuneus with rows of punctures at base, and acute granules toward the tip. Veins of membrane brown, submargin of the apical areoles with a series of brown dots. Wings pale testaceous, with the veins whitish. Legs dull pale testaceous, with the tarsi more or less dusky, and the nails brownish. Venter yellowish white, pulverulent, last segment narrowly bordered each side with black. The hemelytra are sometimes spotted with brown at intervals on the costal area and disk, and a series of interrupted brown lines is conspicuous next the inner margin of the cuneus, while the veins are variable in the extent of embrownment. Two pale brownish spots are sometimes present on each

side of the mesonotum, and brown specks appear on the side of the cheeks before the eye.

Length to end of abdomen 7–7½ mm. To tip of hemelytra 10–11 mm. Width of mesonotum 2½ mm.

This may be a form of *Elidiptera punctifera* Walk., Brit. Mus. Cat. Homopt. Suppl., p. 71 or his *E. punctata* ib. Vol. I, p. 332, but the descriptions do not fit any of the specimens that I have examined.

Common on small logwood trees in San Domingo and Hayti, in February, March, April, May; also found in Cuba and Florida.

Ormenis, Stal.

O. robusta, new sp.

Short and stout, plumbeous, clouded with black. Vertex very short, depressed across the middle, truncated at the anterior margin, front nearly twice as long as wide, carinated each side, with a groove between the lines and the outer covered margin, the middle and outer margin obscured with blackish, with the apex broadly pale, clypeus long, acutely triangular, pale, carinated on the middle line. Pronotum sublunate, turned up at tip, widely entering and overlapping the vertex, pale brownish, transversely indented before the apex, the sides narrow, carried down, sunken under the eyes and with the edge reflexed, mesonotum broadly sublunate, elevated on the forward portion, carinated on the middle line, dark brown on the sides outside the lateral carinæ of dorsal shield, scutellum acutely triangular, elevated, with the margins prominently carinated. Hemelytra broad, pale dull yellowish, the humeral costal angle broad, ovally rounded, inner field of the cuneus ribbed and coarsely granulate in diagonal rows, veins mostly black, coarse, those next the membrane partly reticulate, thinner, areoles of the disk mostly quadrangular, membrane a little widened next the tip, the apical border sinuated, carrying a row of pale dots, with the upper angle broadly rounded and the lower angle less rounded. Tibiæ obsoletely clouded with fuliginous, tarsi dark Underside of body testaceous, covered with white bloom.

Length to end of abdomen 4½ mm. To apex of hemelytra 6½ mm. Width of mesonotum 2 mm.

I have examined two females belonging to the collection of Mr. E. D. Ball, from Port au Prince, Haiti, February, and others were secured near Samana Bay, San Domingo.

INDEX.

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